

ECE 2035, Programming Hardware/Software Systems

Syllabus

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1 Basic information

1.1 Course description

This course presents execution and storage mechanisms used to support high level programming languages and operating systems. This design-oriented course describes how complex mechanisms are created using operations and storage defined in an instruction set architecture. Assembly language examples illustrate key course concepts. Lecture material is reinforced by design projects that require C programming and RISC-V assembly language programming, focusing on performance and storage resource requirements on hardware platforms.

1.2 Learning outcomes

Upon successful completion of this course, students should be able to:

- Develop a software design using appropriate data and procedural abstractions given an engineering problem specification.
- Implement high-level programming language storage, control, and procedural constructs in the assembly language of a hardware platform.
- Use commonly available tools for software development, system management, debugging, performance monitoring, and optimization.
- Develop a software system that uses multiple files and libraries.
- Develop, test, and deploy reliable software using appropriate operating system capabilities (e.g., file and directory access, I/O interface).

1.3 Logistics

Meeting times are as follow:

Section	Time	Place	Instructor
C	3:30pm-4:45pm TR	Clough 144	Epstein
D	5:00pm-6:15pm TR	Clough 144	Epstein

Please attend only the section for which you are registered.

1.4 Contact

The principal instructor for this course is:

Name	email	Office hours	Office hours location
Jeff Epstein	jeff.epstein@gatech.edu	by appointment	Klaus 3308

Contact information and schedules for this course’s TAs will be posted on our Canvas page.

The course instructor offers office hours by appointment. Please request an appointment by email.

When contacting a member of the teaching staff by email, please use the course code (“ECE 2035”) in the subject, so that we know the context.

Please do not send source code as an email attachment. Assignments are not accepted by email.

1.5 Prerequisites

Students should have completed ECE 2020 or its equivalent. In particular, students should be familiar with:

- a principles of a datapath generally
- datapath components
- memory
- the specifics of a single-cycle datapath

In addition, students are assumed to have basic experience in programming with a language such as Java or Python. This includes familiarity with:

- variables
- types
- conditionals
- loops
- functions

1.6 Textbook

Our textbook is Introduction to Computing Systems, 3rd edition, 2019, by Patt and Patel. This textbook is optional.

1.7 Topics and schedule

Anticipated topics to be covered include the following.

- Introduction to High Level Language and Assembly Programming
- High Level Programming Language Syntax
- Processing: ISA datapath and controller
- Control: conditionals, iteration, recursion
- Storage
 - static
 - stack

- heap
- Supporting Procedural Abstraction
 - procedure calling
 - activation frames
- Supporting Data Abstraction
 - structs
 - arrays
 - linked lists
 - hash tables
- Compilation, assembly, linking, loading, libraries
- File Systems and I/O
- Exception and Interrupt Handlers
- Software Performance & Reliability
 - testing
 - debugging
 - performance monitoring
- Embedded Software
 - interaction with the execution platform
 - energy efficiency
- Basic Concurrency in Multicore Systems
 - data-level parallelism
 - support for atomicity
- Optional Advanced Topics:
 - Dynamic typing
 - Automatic storage reclamation (garbage collection)
 - Security issues (e.g., software protection against buffer overflow or heap exploits)

A detailed course schedule will be posted on the course’s Canvas page.

2 Coursework

2.1 Grading rubric

Your final numeric grade will be calculated with the following composition:

Component	Weight
Midterm exams (3)	40%
Homework (3)	10%
Projects (2)	20%
Final exam	25%
Participation	5%

Your final numeric grade, expressed as a percent of the maximum possible numeric grade, will be converted to a final letter grade based on the following table. Cutoff values are the same for all

students. The instructor reserves the right to adjust the below minimum cutoffs lower, but not higher.

Letter	A	B	C	D	F
Minimum	90	80	70	60	0

Students may be interviewed about any material they submit for grading. Students are expected to understand and to be able to explain any answers or code that they submit. A failure to adequately explain work submitted under your name may be interpreted as an indication of an academic integrity violation.

2.2 Homework and projects

Homework and projects are intended to help you gain familiarity with new tools and techniques. Homework and projects are to be completed individually by each student. Homework and projects will be posted on Canvas. Submission instructions are included in each assignment.

Homework and projects in this course may be very time-consuming. Please plan accordingly.

Students should aim to submit all homework and projects before the due date. The Canvas page for each homework and project assignment specifies the policy in case of late submission. In general, assignments may be submitted up to 5 days after the posted due date, with a 10% late penalty per day. The late penalty is assessed in a pro-rated, incremental fashion, so that assignments submitted less than a whole day late will have a proportionally lower penalty. The final part of the last project will not be accepted after the deadline.

2.3 Participation

Your participation grade will be determined by completion of simple exercises available on Canvas.

2.4 Exams

Exams are significant in-class assessments, which test students' knowledge of course material. All exams are cumulative, although midterm exams will focus on material covered more recently.

The duration of each midterm exam is 50 minutes. The duration of the final exam may be the full two hours and fifty minutes, or less, depending on the number of questions. The date of each exam is indicated on the course schedule.

Each midterm exam has the same weight: your overall midterm exam grade is the average of all your midterm exam grades.

Exams are accessed on the JQuiz system. All exams are administered during class time. Students who are not present in class during the assessment will receive a grade of zero for that exam.

During the exam, use of outside resources, use of phones, communication between students, and use of any other program or web site is prohibited.

Exams are to be taken on your own personal computer, which you must bring with you to class. It is your responsibility to ensure that your personal computer is with you, working, connected to the internet, and charged: technical issues with your personal computer equipment or internet connection are not valid justifications for accommodation or make-up exam. If you do not have your computer on the day of an exam and have not already made alternative plans with your instructor, you will receive a grade of zero for that exam.

In order to get credit for an exam, you must be physically present in class during the administration of the exam, and must present your Georgia Tech ID card to a proctor upon request. Failure to comply will result in receiving a grade of zero for that exam. Attempting to circumvent these policies may constitute a violation of academic integrity.

If your score on the final exam is greater than your lowest midterm exam grade, it will be used to replace your lowest midterm exam score. It cannot replace a zero that results from either an unexcused absence or a violation of academic integrity.

3 Technology and tools

Each student should have consistent access to a personal laptop computer with either Linux, Mac OS, or Windows operating system, and a stable internet connection.

Students are responsible for maintaining their computing equipment in good working condition at all times. Technical issues with personal computer equipment and internet connection are not valid reasons for requesting deadline extensions or other accommodations. You may be able to temporarily borrow a laptop from the library.

Students are responsible for protecting against data loss. It is recommended that students create regular backups of their work. Losing work due to accident or malfunction is not a valid reason for requesting deadline extensions or other accommodations.

Students are responsible for ensuring access to the Georgia Tech network infrastructure and services, using the Georgia Tech VPN if necessary. Follow the instructions to download and install the appropriate VPN client for your system.

3.1 Canvas

We will use Canvas for course information and discussion.

Students are encouraged to make use of Canvas's discussion forum to ask and answer questions about course material. The principal instructor, the TAs, and other students will do their best to help you.

Although you are free to use the discussion system to discuss course material, posting solutions is prohibited by the course's academic integrity policy. Posting inappropriate comments on the discussion forum may result in a grade penalty.

3.2 JQuiz

Exams will be administered on JQuiz. You should receive an email with your login credentials. If you can't log in, please contact the course instructor. You can access JQuiz from your computer when connected to the campus network. In order to access JQuiz from home, you must first log in to the Georgia Tech VPN. Please note that the so-called "clientless VPN" is not compatible with JQuiz: you must install and use the GlobalProtect VPN available at the link above.

After your work has been graded, you'll be able to review your grade on JQuiz, under the "Grades" tab. Students should carefully review their grade to make sure they understand any applied penalties and to learn from the feedback. In addition, you should review your graded work in a timely manner if you wish to submit a regrade request.

JQuiz requires a recent web browser. In particular, JQuiz will not work with certain older versions of Safari. If you get a blank screen when accessing JQuiz, please upgrade your browser.

3.3 VSCode and ERNIE

VSCode is a code editor and development environment. It is available for all modern operating systems. Students should download and install VSCode.

ERNIE is a RISC-V emulator and debugger, installable as an extension to VSCode. You will need ERNIE in order to complete the assembly language programming assignments for this course.

3.4 ECE Linux Cluster

We will make use of ECE's Linux cluster for developing software. The cluster consists of several Linux-based servers. Please note that accessing the cluster from an off-campus network may require connecting through the Georgia Tech VPN.

You can access the cluster remotely from your own computer via the `ssh` command. Alternatively, you can access the cluster's servers in person through the department's computer labs.

3.5 ESP-32 Kit

The ESP-32 is a low-power microcontroller that will serve as the basis for some of the course's projects. Students are responsible for acquiring the necessary components, as detailed below. Students are encouraged to get the components as soon as possible, as a failure to do so will not justify an accommodation.

3.5.1 ESP-32-C6

This component includes ESP-32 system-on-a-chip, as well as an LCD screen, and other associated parts.

It can be borrowed from the Georgia Tech library for 120 days, which will cover the entire semester. Please visit the Information Desk on the ground floor of Price Gilbert Memorial Library.

Please test your kit thoroughly as soon as possible. If any part is not working, return it to the library.

The kits have been made possible by the ECE Cares program to help reduce the cost to students.

3.5.2 Breadboard and wires kit

These are additional components for use with the system-on-a-chip. Each student must purchase this. It can be bought from online retailers such as Sparkfun, DigiKey, and others. It may also be available for in-person purchase on campus during the second week of the semester.

If you have already purchased these components for ECE 2031, those should be sufficient: you do not need to purchase another set.

4 Policies

4.1 Classroom expectations

Students are expected to arrive to every class promptly: please avoid causing a disruption with a late arrival. You should be actively engaged in the learning process during the duration of the class time.

Attendance is in-person and recorded lectures will not be available, unless you have registered for a remote section.

In the event of a campus closure due to inclement weather or other disruption, lectures will be delivered remotely, in accordance with Georgia Tech policies.

You are expected to take notes during lecture. Please be prepared to do so.

Active participation in class discussions is strongly encouraged. This is the best time for students to ask questions or clarify any confusing concepts. To participate, please just raise your hand. Students are responsible for any material covered in class, even if it isn't in the textbook. If you miss a class, you should contact a classmate to recover the missed content.

When in class, please disable or silence any device that may audibly disrupt the class.

During class time, please do not use your phone or computer for activities unrelated to the course. Please do not eat, drink, chew gum, or sleep during class.

4.2 Communication

Your instructor may use email to make announcements. It is your responsibility to check your university email account regularly.

Assignments will typically be posted on Canvas. It is your responsibility to check Canvas for assignments, and to submit your work in a timely manner.

4.3 Fairness, deadlines, absences, make-ups, and extra credit

This course abides by a principle of *fairness* which stipulates that all students receive the same opportunity to complete the same work; that they are evaluated by the same metrics; and that those metrics are transparently interpreted into grades by the same rubric. This principle ensures that students can feel that their work is evaluated uniformly and without bias; and that their grades are truly earned. The following particular course policies, among others, implement this principle:

- All deadlines are strict, final, and automatically enforced. It is the student's responsibility to ensure that they fully and correctly submit their assignments in advance of the posted deadline. If you miss the deadline for any reason, the submission will be penalized in accordance with policy, and no submission will be accepted after the closing date of the assignment. After submitting, verify that the submitted materials are complete and correct. Please do not wait until the last minute!
- In general, there is no opportunity for students to make up a missed assessment (such as an exam or quiz), or to reschedule such an assessment. Please ensure that you are present during assessments.
- Each student's assignments are graded according to objective measures based on a common grading schema. Each student's final grade is calculated according to the rubric given in the syllabus. In the interest of guaranteeing a fair and transparent grading system for all students, factors pertaining to the individual student and not explicitly listed in the rubric will not be considered in grading. Please do not ask for unfair adjustments to your grade, such as those based on perceived effort or external obligations, as doing so would produce a subjective and unequal evaluation system.
- Assignments are given to the class as a whole, not to individual students. It would be unfair to offer an extra-credit assignment or alternative evaluation to an individual if others in the class do not have the same opportunity. Please do not ask for such an unfair advantage.
- Although it may occasionally be necessary for students to be absent from scheduled classes or laboratories for personal reasons, students are responsible for all material covered during their absence, and they are responsible for the academic consequences of their absence.

However, make-up or rescheduling opportunities may be allowed in certain exceptional situations:

- In the event of a family emergency; or a medical emergency or an illness that is severe enough to require medical attention, students will be entitled to appropriate accommodation for missed assignments. In such a case, students are responsible for contacting the Office of the Dean of Students as soon as possible to report the medical issue or emergency, providing dated documentation from a medical professional, if appropriate, and requesting assistance in notifying their instructors. The medical documentation will be handled confidentially within the Office of the Dean of Students and will inform a decision as to whether communication with instructional faculty is appropriate. In addition, students must notify the instructor as

soon as possible about their intent to request accommodation; failure to promptly notify the instructor will result in forfeiting the accommodation.

- Students who are absent because of participation in approved Institute activities (such as field trips, professional conferences, and athletic events) will be permitted to make up the work missed during their absences. Approval of such activities will be granted by the Student Academic and Financial Affairs Committee of the Academic Senate, and statements of the approved absence may be obtained from the Office of the Registrar. To request approval, please fill out the Institute-Approved Absence form and notify your instructor at least 2 weeks prior to the event.
- Students who are absent because of participation in a particular religious observance will be permitted to make up the work missed during their absence with no late penalty, provided the student informs the course instructor of the upcoming absence, in writing, within the first two weeks of the semester, and provided the student makes up the missed material within the time frame established by the course instructor.
- Students will be provided with accommodation for making up graded work due to civic duty, when such duty conflicts with an in-class activity and cannot be rescheduled. Civic duty includes voting in federal, state, and local elections and participating in jury duty. Students must notify the Office of the Dean of Students about their absence at the earliest possible time.

More information is provided in the relevant section of the course catalog.

4.4 Academic accommodations

Georgia Tech offers accommodations to students with disabilities. If you anticipate issues related to the format or requirements of this course, please meet with the instructor within the first week of the semester to discuss ways to ensure your full participation in the course. If you determine that disability-related accommodations are necessary, please register with the Office of Disability Services as soon as possible, and present your accommodation letter to the instructor.

Students who have already been approved for accommodations through the Office of Disability Services must schedule an appointment with the instructor to discuss their academic accommodations. Afterwards, accommodations must be requested from the instructor one week in advance of each instance of their use. Accommodations for exams are provided only through the Testing Center, and their use must be scheduled in advance through the Office of Disability Services.

4.5 Regrades

You are entitled to a fair and accurate evaluation of your work, including homework, quizzes, exams, and any other graded work for this course. If you believe that your work has been graded unfairly or inaccurately, you may request a secondary evaluation (henceforth, “regrade”) of your work from your instructor.

In the case of homework and projects, your work is graded by a teaching assistant; before contacting your instructor about a possible regrade, please discuss the matter with the grader. Only after you

have clarified the situation with the grader should you submit a regrade request to your instructor. A request for regrade must be submitted to your instructor by email within one week of the initial release of the grade. A regrade request must specify the assignment and question to be considered, and must contain an explanation of why the student believes that the grading is unfair or inaccurate. Regrade requests are not accepted by means other than email. Regrade requests received after one week will not be accepted, and at that time all grades are considered final: students are therefore advised to check their grades and review their work promptly. Grades released near the end of the semester have a shorter window for regrades due to the semester grade deadline.

Please note that a regrade may result in a revised grade higher, lower, or the same as the original grade. Submitting regrade requests in bad faith or without appropriate justification will result in a grade penalty. Do not use artificial intelligence to generate regrade requests.

4.6 Getting help

This is a challenging course. If you are struggling with the material, it is your responsibility to take action to improve. There are a variety of ways to get help:

- Ask questions in class. A classroom discussion is the most direct way to understand the material thoroughly.
- Meet with a TA. The teaching assistants offer regular office hours.
- Meet with the instructor. The instructor offers office hours by appointment.
- Send an email. You can contact your instructor or a TA by email to ask questions about the homework or course material.
- Read the book. You may prefer the presentation of material in a textual format.
- Ask on the discussion forum. The class site may have an on-line discussion forum where you can post questions.

When asking for help, please consider these guidelines:

- **Don't wait until the last minute.** It's your responsibility to complete assignments on time. Plan accordingly: allow enough time to get any requisite help *before* the deadline. If you are struggling with the material, get help as soon as possible.
- **Provide information along with your question.** The person helping you will need to know something about your problem. You should provide pertinent context. Be sure to tell them what you are trying to do, what you already did, what happened, and what you expected to happen. Include any relevant code, error messages, or screen shots. Don't just say "It didn't work."
- **Don't expect someone else to do your work for you.** The goal of asking for help is to gain a better understanding of course material. However, when it comes to graded assignments, you still need to do the work for yourself. Expect guidance, not solutions.

4.7 Academic integrity

We aim to ensure that your grade reflects your understanding of the material, and therefore we require that all work that you submit, including but not limited to any homework, quiz, exam, or project, be a result solely of your own understanding and effort, except for ungraded in-class exercises, and for those submitted works where collaboration among students is explicitly allowed.

This course is bound by Georgia Tech's Student Code of Conduct and Honor Code. Suspected violations of academic integrity may be handled through Faculty Conference Resolution or via referral to the Office of Student Integrity.

Motivation

Why do we take academic integrity seriously?

- By committing academic dishonesty, you are depriving yourself of an opportunity to learn. The challenging work in this course is intended to enhance your skill and understanding. If you bypass that work, you will have failed to learn the material and reduced the value of your college education. Your grade has value only if it accurately represents what you've accomplished to achieve it.
- Academic dishonesty damages the university as an institution. Employers preferentially hire Georgia Tech graduates because the Georgia Tech degree is conferred on those who have achieved a certain level of education. Acquiring a degree through dishonest means damages the university's reputation and brand.
- Finally, academic dishonesty produces an environment that is unfair to your classmates. If you achieve a grade through dishonest work, students who complete the assignments honestly are at a relative disadvantage.

Policy

We realize that it's not always clear what activities are acceptable in the context of working on your assignments. This is especially true in our field, where the web can provide excellent learning resources (good!) as well as solutions to assignments (bad!).

To help you understand the boundaries of what is and is not acceptable, we provide the following guidelines, which are based on the Stanford CS107 collaboration rules. We classify activities into three categories, according to a traffic light model: those activities that are always acceptable (**green light**), those that are acceptable but require a citation (**orange light**), and those that are never acceptable (**red light**).

Acceptable activities

- **Green light** Discussion of general course topics.

You may freely discuss the course material, outside of the context of a specific assignment. This means you can ask and answer questions about the rules of the programming languages and tools that we use, as well as theoretical matters that were covered in lecture or in the textbook. However, the discussion may not refer to solutions for a specific assignment.

For example: "What does the `elem` function do? What is the syntax for a function definition?"

- **Green light** Discussion of assignment requirements.

You may freely discuss the requirements for a specific assignment. However, the discussion may not refer to solutions.

For example: “Are we allowed to use **reverse**? Is performance important?”

- **Green light** Use of public resources for background information.

Web sites, books, and other public resources provide lots of great information. You are expected and encouraged to refer to documentation for the languages and tools that we use, as long as they don’t refer to the specific task for your assignment.

For example, the official Python documentation is okay, but “How to write Space Invaders in Python” is not okay (assuming the assignment is to write Space Invaders).

- **Green light** Discussion with teaching staff.

This is the best way to get help! You can always turn to your instructor and TAs with any questions. You can ask questions about any assignment during class, during office hours, or by email.

Activities requiring a citation What is a citation? If you participate in one of the activities in this section, you must state so in the assignment that it pertains to. If the assignment is a coding exercise, you must write a comment in your code describing the activity. If the assignment is non-code work, you must write a preface describing the activity. Appropriate citation of all external sources is required, including the acknowledgment of any collaboration or assistance.

Every citation must describe (a) the specific source of the information that you used (a person, a book, or a web site), and (b) how you used that information, and to what extent it influenced your work. Failing to provide a citation when participating in one of these activities renders the activity unacceptable, and therefore a violation of academic integrity.

- **Orange light** Re-using your own work.

If you are submitting your own work, including code that you originally completed before you took this course, you must provide a note stating this fact, stating when you originally did the work and under what conditions.

If you want to submit work that you have previously completed for an earlier instance of this course, or for any other course, you must discuss the matter with your instructor before proceeding. In general, you are not allowed to re-submit work completed in an earlier semester.

An exception to this rule applies if you have previously violated academic integrity in this course. In that case, you are prohibited from re-submitting any violating work or any work based on that work.

- **Orange light** Discussion of testing.

If you aren’t sure if your solution is correct, it can be helpful to develop a strategy to test it. You may propose and discuss tests collaboratively, as long as you provide a note describing the incident. For example, you may remind a friend that a particular function needs to work with empty lists. However, you may not see each other’s code or discuss it in detail.

- **Orange light** Discussion of debugging.

You may discuss particular error messages and propose possible solutions, as long as you provide a note describing the incident. For example, if a friend says they are getting a “segmentation

fault,” you may suggest that they might be dereferencing a null pointer. However, you may not see each other’s code or discuss it in detail.

Unacceptable activities

- **Red light** Copying code or answers from others.

The work you submit must be written entirely by you. This means that the ideas behind it are yours. You may not copy code, read code, or consult code of which you are not the sole author, directly or indirectly. This prohibition includes copying code from the web. You may not base your code, in whole or in part, on someone else’s code.

- **Red light** Collaborative development.

You may not work together with another person, and your submitted solution must not be influenced by anyone else’s input. The prohibition includes collaboration with students as well as non-students. Any sharing of technique, design, pseudocode, structure, or substance, even in partial or incomplete form, is not acceptable. Use of tutors or tutoring services on your assignments and assessments is prohibited.

- **Red light** Developing code or solutions with the help of artificial intelligence.

Your submitted work must be based solely on your own understanding. Completing your work with the help of an AI system, such as ChatGPT, Claude, and Gemini, violates that condition. Therefore, using these or any similar system, in any capacity whatsoever, to complete an assignment or assessment is prohibited. This prohibition includes any AI-based code-completion tools that are built into your code editor, which you are therefore required to disable. Specific assignments may have additional restrictions or relaxations of this policy: be cognizant of the rules for a given assignment.

- **Red light** Using public resources for assignment-specific code.

Web sites, books, and other public resources can provide valuable information, but any resource that refers to the task that you are to complete for the assignment, or to a task that is substantially similar to it, is not allowed. The design and implementation of your solution may not be influenced or inspired by an external resource. Taking code, in any quantity, from a web site is prohibited. Students are prohibited from consulting any web site or resource that addresses the design or implementation of a program similar to the task at hand.

In particular, consulting “coursework aid sites” such as Chegg and CourseHero is prohibited.

The boundary between “general background resources” and “assignment-specific resources” may be fuzzy. If you have any doubt that a resource you are using is acceptable, ask your instructor first.

- **Red light** Allowing others to use your code or answers.

At no point should anyone else have access to your work. This means that you may not keep your work on a shared or public computer. You may not post your work on a public web site (including Github and similar sites). You may not show your work to others, even if they promise not to use it in their own work. Your work should remain private, and if at any time it isn’t, then you have contributed to academic dishonesty.

You may use Github (and similar sites) as version control storage, but it is your responsibility to ensure that your repository is private. If your code is publicly visible at any time, it constitutes a violation of this policy.

Posting your work on “coursework aid sites” such as Chegg and CourseHero is prohibited.

The prohibition on sharing your work remains in effect even after you have submitted your work, after the due date has passed, and after the course has ended. Be aware that other students may attempt to submit your work as their own without your knowledge. Students in future semesters should not have access to your work.

- **Red light** Violating the environmental conditions for an assessment (such as a quiz or exam).

Assessments are typically administered in a proctored environment, where students do not have access to external resources. Violating the requirements for the administration of an assessment by, for example, communicating with other people during the time period of the assessment, tampering with or bypassing any software tools used in the administration of the assessment, using prohibited materials or devices during the time period of the assessment, or accessing the assessment outside the intended environment, represent a violation of academic integrity. Prohibited devices include, but are not limited to, smart watches, smart glasses, headphones, earbuds, and mobile phones, unless otherwise explicitly allowed. All software and websites not explicitly allowed are prohibited.

Examination materials are available only to those students taking the assessment during the period of the assessment. Exfiltrating the content of an assessment (for example, by photographing questions) is a violation of academic integrity.

- **Red light** Deliberately providing false information.

Falsifying or failing to provide a required citation is unacceptable. Questions about the provenance of work must be answered honestly. Attempting to deceive the instructor is a violation of course policy. Providing falsified documentation regarding an academic accommodation is a violation of course policy.

Additional academic integrity policies

If you are in doubt about whether a particular activity is acceptable, please consult with your instructor.

If you are struggling in the course, please discuss your situation with your instructor. Violating academic integrity is not a solution.

Students may be interviewed about any material they submit for grading. Students are expected to understand and to be able to explain any code they submit. A failure to adequately explain work submitted under your name may be interpreted as an indication of an academic integrity violation.

Violations of academic integrity will result in referral to the Office of Student Integrity. Penalties will depend on the severity of the transgression and each individual student’s history of transgressions. Penalties range from a zero score on an assignment or test, failing the course, or even more severe university-wide actions such as suspension or expulsion from the university. Students with a pending

case before the Office of Student Integrity will not be allowed to drop or withdraw from the course; those who do so will be reinstated.

Preventing violations of academic integrity is everyone's responsibility. If you become aware of an instance of academic dishonesty, even if you are not directly involved in it, you are obligated to report it to your instructor.

If you have violated academic integrity, your first step should be to reach out to your instructor so we can work together to find a way for you to move forward with integrity. A timely request to retract a compromised work or apply an amended citation that properly credits authorship could rectify the misrepresentation that would have otherwise been the basis for a strict punishment.

4.8 AI guidelines

Modern artificial intelligence, in particular Large Language Models (LLMs) such as ChatGPT, Claude, and Gemini, can provide valuable help for students in learning course material. Use of these tools is *not* prohibited in this course. However, there are restrictions on their use. It is your responsibility to be aware of these restrictions so that you use these tools in compliance with the course rules, as described above. The guiding principle of these rules is that students may use AI to help with learning, but not to help complete any graded assignment or assessment. In other words, you should use AI as a **teaching assistant**, not as a **solution generator**.

These guidelines are based on the Stanford CS336 AI-use guidelines.

Permitted uses of AI

- To explain concepts when students are confused by guiding them in the right direction and making sure they build the understanding themselves
- To point students to relevant lecture materials, handouts, official documentation, and debugging tools
- To help debug by asking guiding questions rather than providing fixes
- To explain error messages from the compiler or other development tools
- To help students understand approaches or algorithms at a high level

In all cases, when consulting explanations from an AI, please take into account that the AI's answer may be wrong or misleading. Furthermore, the AI's answer may be technically correct but nevertheless diverge from course material. Students are responsible for their own submissions, regardless of answers provided by AI.

Prohibited uses of AI

- To write, modify, edit, or debug any code or pseudocode
- To design a program, even in abstract, partial, or incomplete form
- To review code written by a student, or provide any suggestions or improvements about a student's code
- To give solutions to any question appearing on an assignment or assessment, or to implement any component of such an assignment or assessment

- To convert assignment requirements directly into working code
- To refer students to third-party implementations of any component of any assignment or assessment
- To give ideas or suggestions about how to solve a problem

If you are in doubt about whether your use of AI is acceptable, please consult with your instructor.

4.9 Professionalism and respect

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgment, and responsibility among faculty members and the student body. See the course catalog for an articulation of some expectations.

All members of the university community should treat each other with respect. Inappropriate behavior in or out of the classroom is not acceptable. If you experience or witness inappropriate treatment, please contact the instructor.

Violations of this policy may warrant a grade penalty or a referral to the Office of Student Integrity.

4.10 Student well-being

The Center for Mental Health Care & Resources offers in-person and virtual appointments. For more information on these and other student services, contact Student Life.