CS 2110 – Computer Organization and Programming
Syllabus – Fall 2026

Sections A, A01 – A04, FA1 – FA2 , FAA, GR/GR1: In-Person Attendance/Lectures
Sections O1, O01 – O02: Online Attendance, Lectures via Asynchronous Video

Course Description: An introduction to basic computer hardware, machine language, assembly language, and C programming.

Course Purpose: This course introduces you to **the fundamentals of how computers work** from both the hardware and software points of view. It serves as a "roadmap" for the rest of the computer systems courses that you will take here. After taking this course, you will have a better understanding of how a program is translated into commands for execution on hardware, and how the hardware executes those commands using, ultimately, electrons to do the work.

Course Objectives/Learning Outcomes:

1. To understand the structure and operation of a modern computer from the ground up.
2. Understand basic hardware concepts: digital circuits, gates, bits, bytes, number representation
3. Understand the Von Neumann model and the structure and operation of a basic data path
4. Understand the structure and function of machine language instructions
5. Understand the structure and function of a symbolic assembly language
6. Understand basic concepts of computer systems such as the runtime stack, simple I/O devices
7. Introduce the C language with particular emphasis on the underlying assembly and machine language as well as interaction with hardware.

Course Materials:

1. [**required**] **Patt & Patel**: Introduction to Computing Systems: From Bits & Gates to C++ & Beyond, **3rd Ed (2019)** ISBN-13: 978-1260565911
2. [optional] The C Programming Language, Kernighan & Ritchie, 2nd Ed (1988) [highly recommended] ISBN-13: 978-0131103627

Reading Topics:

Topic	P&P Section(s)
Course Intro, Bits, & Data Types	1.1-1.7, 2.1-2.4
Operations on Bits & Other Representations	2.5-2.7
Digital Logic Structures	3.1-3.2
Combinational Logic Circuits	3.3
Logic Synthesis	(Notes)
Basic Storage Elements	3.4-3.5
Sequential Logic Circuits	3.6-3.7
Von Neumann Model, LC-3, & Instruction Processing	4.1-4.4
The ISA & Operate Instructions	5-1-5.2
Data Movement Instructions & Control Instructions	5.3-5.5
Data Path, Problem Solving, & Debugging	5.6, 6.1-6.2
Assembly Language Programming, Assembly Process, & Assembly of Multiple Programs	7.1-7.4
Stack, Queue, Character Strings	8.1, 8.4-8.5
Subroutines, Traps	8.1, 9.3
Assembly I/O	9.1-9.5
Intro to C, Variables, Scopes	11.1-11.6, 12.1-12.2
Operators, Conditional Constructs, Iteration Constructs	12.3-12.7, 13.1-13.6
Pointers	16.1-16.2
Arrays, Strings	16.3-16.4
Functions, Calling convention	14.1-14.5
Recursion, Calling convention	17.1-17.8
Testing and Debugging	**15.1-15.6**
Structures in C	19.1-19.3
Dynamic Memory Allocation	19.4-19.6
I/O in C	**18.1-18.6**
Introduction to C++	**20.1-20.5**

Course Prerequisites: A grade of C or higher in CS 1331, Introduction to Object-Oriented Programming

Grading Policies & Weighting:

The course has projects, quizzes, homework assignments, and a final exam:

- 30% Projects (5 projects, 6% each)
- 40% Quizzes (4 quizzes, 10% each)
- 7% Homework (7 assignments, 1% each)
- 3% Lab Attendance
- 20% Final Exam

1. Final grades will use the scale: [100:90] = A, (90:80] = B, (80:70] = C, (70:60] = D, (60:0] = F.
2. A linear "shift of means" curve *might* be applied to your final score. (Historically, this has been *at most* +2 points.)
3. There is no extra credit provided in this course.
4. **All assignments must be turned in on time.** Late assignments are capped using the late assignment window as follows:
   - On time: 100% (maximum score)
   - After deadline, before 24 hours after deadline: 70% (maximum score)
   - After 24 hours, before 48 hours after deadline: 50% (maximum score)
   - After 48 hours: 0%
5. **You are also responsible for ensuring that what you turned in is what you meant to turn in**. If you have any problems submitting via Canvas, email the Head TA what you would have submitted BEFORE the end of the late assignment window. No submissions will be accepted after the submission window (later than 48 hours) has closed – **no exceptions.**
6. **The deadline for re-grades is 2 weeks after an assignment grade is posted** or returned to the class. Regrades are only for correct answers accidentally marked as partially or completely wrong. There are no regrades for higher partial credit (i.e., no "point fishing").
7. Some assignments might be due during the final instructional days of the semester.

Attendance Policies:

8. If you have any personal problems (family/illness/etc.) that prevent you from attending lectures, labs, or (especially) graded events, then you must relay these circumstances to the Division of Student Life Office as far in advance as possible.
9. **Quizzes and Exams must be taken at the scheduled dates and times**.
   a. Missing a Quiz: Failure to attend a quiz will result in a zero (0) score. One exception: if – and only if – your excuse for missing the quiz is approved by the instructor, then the missing quiz score will be replaced with your Final Exam score.
   b. Missing the Final Exam: Failure to attend the Final Exam will result in a zero (0) score. You must contact the Head TA or your instructor you have an Institute-approved excuse to reschedule the Final Exam.
10. Lab attendance is very important and will provide much more benefit from this course than just attending lectures or watching recordings. The TAs will discuss important information during labs pertaining to projects and assignments and will also conduct illuminating exercises that complement the concepts presented in the lectures. The lab sessions also have a smaller number of students, which tends to facilitate more open and active discussion and interaction.
11. You must attend labs to earn the Lab Attendance Score. You are permitted 3 unexcused absences, and further absences will reduce your score proportionally. Lab absences do NOT apply to mandatory quiz dates: missing a quiz will still result in a zero unless prior arrangements have been made with the Instructional Staff and Division of Student Life Office.

Other Course Policies and Recommendations:

12. Recordings of lecture, lecture materials and other artifacts are copyrighted by your instructors. **No non-educational reproduction of any materials, including lecture records and recordings, is permitted.**
13. You will be automatically signed up for a Piazza forum for this course. The link will be made available via Canvas. The course Piazza forum is only for posting technical questions about assignments, tests, etc.
14. The Canvas and Piazza announcements must be read every day.
15. **Do not post potential answers to assignments on Piazza!** If you are in doubt whether posting a particular piece of information might violate this rule, then begin by making it a private post to the TAs and instructors only.

16. Notetaking via laptop computer, tablet and paper will be permitted initially. Any computing activities must be focused solely on taking notes and fulfilling course activities. If these conditions are violated, and especially if these violations cause significant disruptions to other students in the class, then these privileges may be suspended.

Academic Honesty & Integrity Policies and Statements:

Preamble: *The goal of all assignments in CS 2110 is for you to learn. Learning requires thought and hard work. Copying answers thus prevents learning. More importantly, it gives an unfair advantage over students who do the work and follow the rules.*

1. **As a Georgia Tech student, you have read and agreed to the Georgia Tech Academic Honor Code.** The Academic Honor Code defines Academic Misconduct as "***any act that does or could improperly distort Student grades or other Student academic records.***"
2. You must submit an assignment or project as your own work. **No collaboration on answers is permitted**. **Absolutely no code or answers may be copied from others. Such copying is Academic Misconduct.**
3. Using code from GitHub, via Googling, from Stack Overflow, etc., is Academic Misconduct (Honor Code: Academic Misconduct includes "*submission of material that is wholly or substantially identical to that created or published by another person or persons*").
4. Publishing your assignments on public repositories, GitHub, etc., that is accessible to other students is unauthorized collaboration and thus Academic Misconduct.
5. Suspected Academic Misconduct will be reported to the Division of Student Life Office of Student Integrity. It will be prosecuted to the full extent of Institute policies.
6. We use accepted forensic techniques to determine whether there is copying of a coding assignment.
7. Submitting an assignment with code or text from an AI assistant (e.g., ChatGPT) is academic misconduct.
8. **If you are not sure about any aspect of this policy, please ask your lecturer**.

Using AI Assistants:

Anything you did not write in your assignment will be treated as an academic misconduct case. If you are unsure where the line is between collaborating with AI and copying AI, we recommend the following heuristics:

Heuristic 1: Never hit "Copy" within your conversation with an AI assistant. You can copy your own work into your own conversation, but do not copy anything from the conversation back into your assignment.
Instead, use your interaction with the AI assistant as a learning experience, then let your assignment reflect your improved understanding.

Heuristic 2: Do not have your assignment and the AI agent open at the same time. Like the previous heuristic, use your conversation with the AI as a learning experience, then close the interaction down, open your assignment, and let your assignment reflect your revised knowledge.

Heuristic 3: Do not integrate or activate AI-based tools directly into your composition environment. Just as you should not let a classmate write content or code directly into your submission, so also you should avoid using tools that directly add content to your submission.

Deviating from these heuristics does not automatically qualify as academic misconduct; however, following these heuristics essentially guarantees your collaboration will not cross the line into misconduct.

Acceptable Student Conduct Policies and Expectations:

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Georgia Tech Student-Faculty Expectations Site articulates some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Services Offered through the Office of Disability Services:

Reasonable accommodations will be made for students with verifiable disabilities. If you are a student with learning needs that require special accommodation, please contact the Georgia Tech Office of Disability Services as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Also, please also e-mail your instructor as soon as possible to set up a time to discuss your learning needs.

Technically Related Policies (e.g., including Coding Guidelines for C/C++ code):

1. You must turn in ALL files specified in the "Deliverables" section of the assignment instructions. We reserve the right to impose a penalty on submissions that do not follow the given submission directions.
2. You must provide a ***Makefile*** that compiles and links your code by default. **If you are given a Makefile with the project, we expect your code to compile with make. (don't worry, we'll explain what all this means later)**
3. Your code must compile with **gcc** on Ubuntu 22.04 LTS. If your code does not compile, then you will receive a zero/0.
4. You will be penalized if your code produces warnings when compiled with the given Makefile, or the following flags if no Makefile is provided: **gcc -Wall -Wextra -Wstrict-prototypes -pedantic -O2**
5. Code should be well commented and use a clean, consistent (readable) style (i.e., proper indenting, etc.). We may impose style requirements and deduct for non-conforming solutions. This is **not** the obfuscated C code competition!

Online Section Policy Distinctions and Exceptions:

The online sections will cover the same material as the on-campus/in-person sections, and online students will complete the same homework assignments, exams/quizzes, and projects. The main distinction is that the online sections will receive the lectures as pre-recorded videos, and the labs will be conducted online via Zoom or Microsoft Teams.

- **Lecture Sessions:** The online lectures will be conducted asynchronously. The material normally presented to the on-campus lecture sessions will be provided via pre-recorded videos for the online sessions. The videos will normally be broken down into smaller 15- to 30-minute segments based on the content for a particular lesson. The pre-recorded videos for a given lesson will be available no later than the morning of the on-campus lecture for that corresponding lesson.
- **Lab Sessions:** There are no designated lab times or locations for the online sections. Lab sessions for the online sections will be conducted online via Zoom or Microsoft Teams. These sessions will be recorded for those unable to attend the sessions live/synchronously. The sessions will cover the same topics as the on-campus lab sessions. Dates and times for these sessions will be announced in advance, and attendance is encouraged as an opportunity to ask questions and receive clarification about the course material and key concepts.
- **Lab Attendance/Participation:** There is no requirement for online students to attend the online lab sessions live, so we will reframe the "attendance" score for them as more of a "participation" score. More specifically, there will be a small Canvas "Lab Participation" Quiz for each online lab session. Each quiz will normally be available for completion within 1-2 days of the corresponding lab session. To earn full participation points, online students must complete the quizzes. Like the attendance scores for on-campus students, online students will be permitted a limited number (e.g., three/3) of missed/unexcused lab participation quizzes, and then any other missed participation quizzes will count (proportionally) against the student's lab participation score. These participation quizzes are primarily being used to verify participation, and not as much to master the concepts, so these quizzes won't necessarily be reviewed immediately; in fact, they will most likely only be evaluated at the end of the semester.
- **Quizzes and Exams:** ***Online students must take the quizzes and exams - including the Final Exam - in person***. There will be a specifically designated date and time (i.e., Tuesdays, 3:30pm – 4:45pm) for students to take any applicable quizzes and exams for that week. The location for these events will be somewhere on the Atlanta Main Campus, and more precise locations will be provided as soon as possible.

Statement for not mentioned policies and issues: Any policies and issues not mentioned in this syllabus will follow policies and procedures according to the Georgia Institute of Technology: http://policylibrary.gatech.edu