Welcome to ECE2035

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.

Course Delivery: This course is delivered in person. In the event of a campus closure due to inclement weather, lectures will be delivered remotely, in accordance with Georgia Tech policies that were revised in August 2023. Refer to the Campus Procedures for Hazardous Weather.

TA's Office Hours Schedule: To Be Updated

TA's Office Hours Location: To Be Updated

Instructor: Dr. Ashutosh Srivastava

Class Time: To Be Updated

Office Hours: To Be Updated

In addition to in class and office hours, feel free to ask (and answer) questions via

- Canvas Inbox or email Instructor: **asrivastava310@gatech.edu**

At all times, everyone is expected to follow appropriate online etiquette.

COURSE GOALS: The learning objectives of this course are to:

- Understand how execution and storage constructs in high-level programming languages and operating systems are implemented on a hardware platform.
- Learn design principles for sequential, procedural programming, the C programming language and RISC-V assembly language, and the use of common tools for software development and performance evaluation.
- Build experience in system-oriented design, focusing on performance and storage requirements of the target application and hardware platform.

COURSE OUTCOMES: Upon completion of this course, you 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).

PREREQUISITES: ECE 2020. It is imperative that you be very familiar with

- The concept of a datapath,
- The major components of a datapath,
- memory, and especially RAM, and
- The specifics of a single-cycle datapath, such as that of the RISC-V processor.

That last point is particularly relevant to transfer students or anyone substituting a different prerequisite, since ECE 2020 specifically covered the single-cycle datapath. We will immediately begin with review of the single-cycle datapath and go into more detail about the RISC-V instruction set architecture (ISA).

GRADING: The final grades are determined based on totals earned during the course.

Assessment	Percentage of total grade:
Exams (2)	30%
Homeworks (3)	10%
Projects (2)	30%
Final Exam (1)	25%
Participation	5%

Grades are assigned as follows (assuming a passing project average): [90-100] = A, [80-90) = B, [70-80) = C, [60-70) = D, [0-60) = F.

Grading concerns should first be directed at the person grading the assignment (e.g., the GTA or UTA for homework & project grades, **Prof. Srivastava** for exams, participation, etc.), but any unresolved issue can be addressed to **Prof. Srivastava** as needed. Also, it is expected that any grading concerns be raised within one week of the grade being posted, because it isn't possible to address a large number of issues in the last weeks of the semester.

CLASS PARTICIPATION: Participation credit is earned by attending lectures and completing lecture comprehension quizzes and tutorial video quizzes.

MIDTERM EXAMS: There are two 60 minute midterm exams each given during our class period in our classroom. They are closed-book, closed-note. Calculators *are not* allowed on the exams. Each exam focuses on the material covered since the last exam. However, due to the cumulative nature of the material, all exams are comprehensive (i.e., they may draw on all material covered in the class thus far.) Each midterm exam contributes 15% of the overall grade.

FINAL EXAM: The final exam covers all material covered in the class. It is closed-book, closed-note and calculators *are not* allowed. The final exam contributes 25% of the overall grade.

ONE EXAM REPLACEMENT POLICY: 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 an Honor Code violation.

MISSED EXAM POLICY: Exams are taken at the scheduled class time or at the scheduled final period. A missed exam will be recorded as a zero. Family emergencies and extreme medical emergencies are handled especially.

TENTATIVE EXAM SCHEDULE (all held in our regular classroom):

Exam1:TBA
Exam2: TBA

Final Exam: Schedule to be posted by end of Feb.

Check the Registrar Website for changes

ASSIGNMENTS: Multiple homeworks and projects are assigned throughout the semester. Homeworks are assigned more frequently, while projects have longer timeframes and are weighted more heavily. All homework assignments and projects are to be completed and submitted individually *with no collaboration or interaction with others* (except TAs and the instructor).

LATE POLICY: The Canvas page for each homework and project assignment specifies the late policy. In general, for all assignments, *except parts of Project* 2, the assignment may be submitted up to 5 days after the posted due date, with a 10% per day late penalty.

Do not hesitate to contact Prof. Srivastava if extenuating circumstances arise. Staying in communication is critical. If you are struggling or falling behind, make an appointment to discuss how to proceed.

ASSIGNMENT INFRASTRUCTURE: To perform the assignments, you need the following:

- **RISC-V Emulator and Debugger** for running assembly language programs in VS Code. (FREE)
- **Linux**: Remote access to ECE Linux servers. (FREE)
- **Mbed classroom kit**
    - Classroom kit consists of two packages (each student needs both):

1. **Mbed/uLCD Loaner Combo**
2. **KIT-26325 Accessories Kit**

- Code examples and tutorials are available here and in the Experiment Guide.
- Optional: you may order a large protoboard and jumper wires at Sparkfun or Jameco. These optional, supplementary parts are usually also sold by Eta Kappa Nu (HKN) at the beginning of the Fall and Spring semesters.

BACKING UP WORK: It is each student's responsibility to create back-ups of work performed in this class. Lost work or time due to computer/disk/web server failures is not a valid excuse for late submissions.

TEXTBOOK: Patt and Patel, *Introduction to Computing Systems*, 3rd edition, 2019. (2nd edition is fine, too.)

ACADEMIC HONESTY: Although students are encouraged to work together to learn the course material, graded class work must be completed individually. Specifically, while you are permitted to discuss the homework and project assignments and algorithms with other students in the class, **you must design, write, and debug your solutions individually. You must not accept/copy/solicit code from, share code with, debug code, or discuss its performance with any AI assistant or any person, except the instructors/TAs. Once you begin implementing your solution, you must work alone. You must not share any code, homework solution or any graded work before or after the due date.**

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 students may have their case heard directly by the Office of Student Integrity.

Students are responsible for understanding all of the detailed explanation of this policy at the page: Academic Integrity Specifics for ECE2035.

Additionally, all code and course materials provided in ECE2035 are copyrighted. They are for the use of the students currently enrolled in the course. Copyrighted course materials may not be further disseminated. You may not, nor may you knowingly allow others to reproduce or distribute code or other course materials publicly. This includes providing materials to commercial course material suppliers such as CourseHero, chegg, and other similar services, or posting your project code on github. Students who publicly distribute or display or help others publicly distribute or display copies or modified copies of ECE2035's course materials are in violation of Georgia Tech's Honor Code.

All exams are to be completed individually with no collaboration or interaction with anyone else. You may neither give nor receive unauthorized assistance on any exam. You may not work with others on the exam and you many not share questions or answers with anyone else, including looking for or posting questions/answers on any website.

All conduct in this course will be governed by the Georgia Tech honor code. Additionally, it is expected that students will respect their peers and the instructor such that no one takes unfair advantage of anyone else associated with the course. Any suspected cases of academic dishonesty will be reported to the Office of Student Integrity for further action.

STUDENT WELL-BEING: Dean of Students Office, CARE Center, Counseling Center, Stamps Health Services, and the Student Center

The **CARE Center** and the **Counseling Center**, Stamps Health Services, and the Dean of Students Office will offer both in-person and virtual appointments. Student Center services and operations are available on the **Student Center** website. For more information on these and other student services, contact the Dean of Students or the **Division of Student Life**.

In addition, please see the **GT Student Resources** module for links to these and many other types of campus resources.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES: If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. When I am notified of your status, I will assign a brief questionnaire for you to fill out on Canvas, which should give me all the information I need. Please contact me if you believe you have additional items to discuss regarding your learning needs. Also, note that accommodation is given as they arise. As an exam approaches, for example, and if you are a student who utilizes the Testing Center, then you must request accommodation according to their requirements. Having discussed accommodation at the start of the semester is not sufficient.

STUDENT-FACULTY EXPECTATIONS AGREEMENT: 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. See this catalog page for an articulation of some basic expectation 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.