

Architecture, Systems, Concurrency, and Energy in Computation

ECE 3058

Course Overview

This course introduces the basic organizational principles of the major components of a processor: the core, memory hierarchy, and the I/O subsystem. Students gain an understanding of the sources of performance and energy dissipation in modern processors and learn the multiple forms and levels of parallelism that have been employed to sustain performance improvements in the industry. Basic principles of the operating system, focusing on threads and networks, are also introduced. Assignments using architecture-level simulators enable the students to explore the operation and tradeoffs in performance and energy and reinforce the concepts learned in the classroom.

Prerequisites

ECE 2020, ECE 2035

Course Instructor

Instructor	Professor Tim Brothers
Email	timothy.brothers@ece.gatech.edu
Office	Van Leer 329
Office	See CANVAS
Hours	And by Appointment

Grading

Lab Assignments	40%
Midterms	40%
Final	20%

“Students must be graded against a set of standards, not solely on their performance relative to their classmates,” according to Rule V of the Rules and Regulations. Thus, no curve will be applied to the class. For more information, consult the Catalog: <https://catalog.gatech.edu/rules/5/>.

Grade as Reported in CANVAS	Letter Grade
≥ 90	A
$\geq 80 \text{ and } < 90$	B
$\geq 70 \text{ and } < 80$	C
$\geq 60 \text{ and } < 70$	D
< 60	F

Course Material

Syllabus and Lecture Material: Via Canvas

Textbook:

Patterson and Hennessey, *Computer Organization & Design RISC-V Edition: The Hardware/Software Interface (1st)*, Morgan Kaufmann, 2020, ISBN 978-0128203316

Lab Resources

- Lab Resources Page: <https://github.gatech.edu/pages/ECE3058/website/>

Ed Discussion

We will be using Ed Discussion for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TAs, and myself. At the end of the semester a report will be run from Ed Discussion, if you are on a boarder between grades your class participation via Ed Discussion will determine if the grade is rounded up.

Rather than emailing questions to the teaching staff, I strongly encourage you to post your questions on Ed Discussion.

Attendance:

Students are responsible for all material covered in class, including changes in exam schedules announced in class. There will be no make-up exams. In case you must miss an exam, please inform the instructor of the absence prior to the exam date.

We will abide by the Institute policy on attendance, see <http://catalog.gatech.edu/rules/4/>. The following policies apply to this course: Students are required to complete all course assignments and in-class activities. Please discuss all absences with the course instructors, prior to the absence if it is planned. If not an excused absence, credit will be deducted from project work and other assignments will not be accepted late.

Religious Considerations:

If you are going to miss class due to religious observances, you must provide a letter with the dates of the absences within the first two weeks of class. The instructors will work with the students on an individual basis to try to accommodate as best as possible. [https://catalog.gatech.edu/rules/4/](https://catalog.gatech.edu/rules/4/Section IV.B.5) Section IV.B.5

Academic Integrity:

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit <http://www.catalog.gatech.edu/policies/honor-code/> or <http://www.catalog.gatech.edu/rules/18/>.

All incidents of suspected dishonesty will be reported to and handled by the office of student affairs. You will have to do all assignments individually unless explicitly told otherwise. You may discuss with classmates, but you may not copy any solution (or any part of a solution). Posting segments of nonfunctional code to Piazza is accepted and encouraged. Posting functional code to any public site is considered a violation of the honor code. Any student suspected of cheating or plagiarizing on a lab or exam will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

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/>, and <http://disabilityservices.gatech.edu/content/welcome-accommodate> as soon as possible, to make

an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible to set up a time to discuss your learning needs.

Accommodations are not applied automatically. You must email me at least 1 week before Lab Due dates and 2 weeks before exams to establish extra time or extended due dates.

Late Submissions:

Late submissions will not be accepted without a university excuse. Please see the <https://catalog.gatech.edu/rules/4/> for more details.

Student Illness

The class is offered in-person and remote with all lectures being recorded. If you feel ill, please join remotely. All submissions are online and unless you are too ill to work, you should be able to complete your remote work while in quarantine or isolation.

If you are ill and unable to do course work please contact the Dean of Students, <https://studentlife.gatech.edu/request-assistance>. Your instructor will not be told the reason, and will work with you to facilitate your learning needs.

Use of Large Language Models (LLM) or Artificial Intelligence (AI)

It is your responsibility to learn the skills, knowledge, and critical thinking required for this course. Over-reliance on AI can hinder your learning process. You are accountable for the content of any assignments or projects you submit. While you are not allowed to use generative AI to write your answers or complete reflections in assignments, you may use it for editorial assistance to improve your writing. In general, use AI as a tool to assist you in this class, such as for editorial help, brainstorming feedback, and surveying existing methods. Always acknowledge the use of AI in any assignment or project.

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 <http://www.catalog.gatech.edu/rules/22/> 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.

Exams:

Exams will be administered in the classroom during class time for the Midterms and during the time specified by the [GaTech final exam matrix](#).

Exams times are variable based on the number of problems on the exam and are designed to test your knowledge of the content in a timed restricted environment. Please note the final exam will be shorter than the time allocation specified in the [GaTech final exam matrix](#).