

“So, why do we need teachers? Well, if you think that the fundamental job of a teacher is to transmit information from their head to their students, then you’re right, they are obsolete... Luckily, the fundamental job of a teacher is not to deliver information. It is to guide the social process of learning. The job of a teacher is to inspire, to challenge, to excite their students to want to learn. Yes, they also do explain and demonstrate and show things, but fundamentally that is beside the point. The most important thing a teacher does is make every student feel like they are important – to make them feel accountable for doing the work of learning.” – Derek Muller of the YouTube channel Veritasium, from the video “The Most Persistent Myth”

ECE 4270 Syllabus

Fundamentals of Digital Signal Processing, Section A, 3 Credits

Fall 2026

Tuesday & Thursday, 2:00-3:15, Klaus 2447

Instructor Information

Instructor: Aaron Lanterman

Email: lanterma@ece.gatech.edu

General Course Information

Description

Introduction to digital signal processing. Sampling theorem, discrete-time Fourier transform, power spectrum, discrete Fourier transform and the FFT algorithm, z-transform, digital filter design and implementation.

Course Learning Outcomes

- Analyze, exploit and create signal and systems with digital signal processing techniques.
- Express signal processing systems in mathematical form.
- Write computer codes describing a signal processing system.
- Analyze signals in terms of their frequency content.
- Analyze mixed analog-digital systems with sampling operations and digital filters.
- Design and implement digital filters.
- Implement FFT.
- Express a complex signal via a dimensionality reduction algorithm such as PCA and ICA.
- Estimate the spectrum of a measured signal.
- Model a signal using parametric modeling techniques.
- Describe how signal processing is used in applications (e.g., audio and digital image processing).

Prerequisites

ECE 2026 and (ECE 3077 or CEE 3770 or ISYE 3770 or MATH 3670) [min D on all]

Course Materials

Oppenheim, Schafer & Buck, *Discrete-Time Signal Processing*, 3rd Edition, Prentice Hall, 2009. 9780131988422. (Required)

Grading Policy

The grade distribution will be as follows: Quiz 1: 18%, Quiz 2: 18%, Final Exam: 30%, Homework: 34%.

Letter grades will be assigned based on traditional breakdowns: 90%-100%=A; 80%-89%=B; 65%-79%=C; 50%-64%=D; below 50%=F.

Quiz 1 and Quiz 2 will be scheduled during the first few weeks of class via a survey to find days most convenient (or least inconvenient) to the most students (note I won't be able to make everyone happy). To facilitate this, figure out what days you have exams in your other classes as soon as possible. The final exam will be at whatever time is chosen by the Registrar's Office.

Description of Graded Components

Homework will be divided between handwritten problems (most) and programming assignments (a few). MATLAB will be used for the programming assignments; you can also use the open source equivalent Octave. Each of you is expected to turn in homework that is completely your own work, but you are encouraged to discuss problems and solution approaches with others. Be sure to attempt each problem on your own before seeking help. Working homework is the best way to learn the material. Homework must be neat and well-organized or it may not be graded or may have points deducted. **Be sure to put your name, date, section, and the assignment number on the front page or on a cover sheet.**

On the homeworks, we can delve deeper into some topics than we can on exams due to time constraints. You should think of doing the homeworks as a fundamental part of the learning experience. They are *not* merely practice for the exams, which is why they are weighted higher than a lot of Georgia Tech courses might weight homework.

If you are unable to complete a homework by the given deadline, turn in what you have done for partial credit so you can move on to the next assignment. (In the case of extreme circumstances, contact me to discuss).

You need not avoid seeing homework solutions from previous offerings of this class or other DSP classes, since I will be creating new homework problems this semester.

However, providing homework solutions to others, in particular uploading them to online archives, is strictly prohibited.

There may be a few small tasks associated with Canvas that will be part of your homework grade. These will be lightly weighted (if a homework is 100 points, a Canvas task will typically be something like 2 or 4 points).

The quizzes and final exam will be closed notes and closed book, but certain formula sheets and other material (essentially pre-made crib sheets) will be provided to avoid the need for memorization. These will be provided ahead of time.

Course Logistics

Canvas

Canvas (<http://canvas.gatech.edu>) is the primary means of distributing information. Homework assignments and will be posted on Canvas. The following information will also be found on Canvas as it becomes available: (1) homework solutions, (2) class grades, (3) this syllabus, (4) links to lecture videos, and (5) miscellaneous handouts. **Providing**

private information from the Canvas website to other individuals, particularly students taking future offerings of this class, or uploading such information to websites or shared Google drives, etc., is strictly prohibited. **DO NOT UPLOAD HOMEWORK SOLUTIONS TO ANY WEBSITE OR OTHERWISE MAKE THEM AVAILABLE TO ANYONE ELSE. KEEP THEM TO YOURSELF.**

On-Line Discussions

We will use Discord to facilitate class discussions. I usually have Discord running whenever I am using my laptop. Please post questions about anything related to the course material, and also answer other students' **general** questions, but **don't give away answers to homework problems** or post chunks of code that are more than a few lines.

Course Policies

Attendance and/or Participation

Attendance is not formally part of your grade, but frankly, why in the world would you sign up for a class with Aaron Lanterman and then *not show up to it*?

If there are extenuating circumstances such as an illness or injury that prevent you from being present for a quiz or the final exam, contact me as soon as possible to discuss arrangements.

On Things that Distract

Please silence all cell phones, tablets, pagers, etc. before entering class. If you forget to do so and receive a call, please shut the noisemaking device down as quickly as possible, and return the person's call *after* class. (Of course, there are reasonable exceptions for emergencies; in such cases leave your phone on vibrate, and answer it as quickly as possible and immediately step out of the room to handle the call.)

In general, please do not text, instant message, web surf, Facebook, tweet, e-mail, play games, etc. during class. It can be quite distracting. **Unless you are specifically using an electronic device to take notes, the preferred position for laptops and tablets during class is in your backpack.**

Major Emergencies

If you have some sort of major life emergency – serious illness or injury, death in the family, house burns down or is flooded, etc. – that seriously impedes your progress in the class, please let me know as soon as possible so we can work something out. You will find professors can be quite reasonable if you keep us in the loop. Please don't disappear with

no warning half way through, making us think that you dropped the class, and then reappear out of nowhere the week before finals asking what you can do to make things up.

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. Review [Georgia Tech's Honor Code](#) and the student [Code of Conduct](#).

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Providing private information such as homework solutions to other individuals, particularly students taking future offerings of this class, or uploading such information to websites or to shared Google drives, etc., is strictly prohibited.

Cute Animal Pictures

After reading this syllabus in its entirety, upload a picture of a quokka, capybara, or chinchilla to the Canvas assignment submission titled "You Know If You Know." Complete this task by the end of the second week of class, at 8:00 PM on Friday.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, [contact the Office of Disability Services](#) (404-894-2563) 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 in order to set up a time to discuss your learning needs.

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. [The Student-Faculty Expectations](#) articulate 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.

Campus Resources for Students

Student Well-Being:

At Georgia Tech, we are concerned about your overall physical, social, and mental well-being. A [comprehensive list](#) of wellness related resources has been compiled and maintained by the Office of the Vice President for Student Engagement and Well-being ([student-resource-guide \(gatech.edu\)](#))