# ECE 2026: Introduction to Signal Processing — Fall 2026

## Instructor Information


| Lecturer | Office | Phone | E-mail |
|---|---|---|---|
| Prof. John Barry (Sec. A) | Centergy 5136 | 404-894-1705 | john.barry@ece.gatech.edu |
| Prof. Elliot Moore II (Sec. B) | Centergy 5128 | 404-385-7354 | em80@gatech.edu |


**Office Hours:** See course information at Canvas course site.
**Website:** Canvas **Discussion:** Piazza

## Required Course Materials

**Required Textbook** *DSP First*, 2nd Edition, by McClellan, Schafer & Yoder, Prentice-Hall, 3 August 2015.
ISBN-10: 0136019250 ISBN-13: 9780136019251

**Required Software** MATLAB student version: https://www.mathworks.com/products/matlab/student.html

## Course Description and Topics

Introduction to signal processing for discrete-time systems. Sampling theorem. Filtering. Frequency response. Discrete-Time Fourier Transform. Discrete Fourier Transform. Z Transform. Laboratory emphasizes computer-based signal processing.

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

- Express signal processing systems in mathematical form.
- Write MATLAB code describing a signal processing system.
- Analyze signals in terms of their frequency content.
- Describe system behavior in terms of impulse response and convolution.
- Analyze linear system behavior in terms of Fourier transform and frequency response.
- Analyze mixed analog-digital systems with sampling operations and digital filters.
- Utilize the z-transform to analyze discrete-time systems in terms of poles and zeros.

- Use complex exponential notation to describe signals and systems.
- Describe how signal processing is used in applications (e.g., audio and image processing).

**Topics Covered**

- **Discrete-Time Signals and Systems**
  - Sinusoids and Complex Amplitudes
  - The Spectrum
- **The Sampling Process**
  - Shannon's Sampling Theorem
  - Aliasing
- **Digital Filters**
  - Finite-Impulse-Response (FIR) Filters
  - Linearity and Time-Invariance: Convolution
  - Frequency Response
  - Infinite-Impulse-Response (IIR) Filters
  - Relationship between Continuous-Time and Discrete-Time Frequency Domains
- **Discrete Fourier Analysis**
  - DTFT: Discrete-Time Fourier Transform
  - DFT: Discrete Fourier Transform
  - DFS: Discrete Fourier Series
  - Application: Spectrograms for Time-Frequency Analysis
- **The Z-Transform**
  - Zeros and Poles
  - Three Domains: Relationship among Time, Frequency, and Z domains
- **Lab Topics** (may include):
  - Introduction to MATLAB
  - Complex Exponentials and the Spectrum
  - Music or Speech Synthesis with Sinusoids
  - Image Processing (e.g., edge detection, de-blurring)
  - Bandpass Filtering: Touch-Tone Decoding
  - Biomedical Applications (e.g., Hearing, Cochlear Implants, EKG)

## Grading Policy

| Component | Weight |
|---|---|
| Recitation | 5% |
| In-class activities | 5% |
| Homework | 15% |
| Lab | 20% |
| Exam 1 | 10% |
| Exam 2 | 10% |
| Exam 3 | 10% |
| Final Exam | 25% |

**Grading Scale** We will follow the traditional grade scale where A = 90–100; B = 80–89; C = 70–79; D = 60–69; F = 0–59. At the end of the semester the actual grade boundaries may be adjusted so that overall class performance meets a recommended requirement. You can safely assume that your assigned grade will never be *lower* than the traditional scale above.

## Requirements for All Submissions

All submissions (homework, labs, and exams) will be handled through Gradescope via Canvas. Paper exams taken in class will be collected at the end of the exam period and uploaded to Gradescope by the assigned TAs. **All students are therefore required to have access to a mobile scanner app on their phone or tablet device.** Suggestions for free scanner apps and submission instructions can be found at: https://gradescope-static-assets.s3-us-west-2.amazonaws.com/help/submitting_hw_guide.pdf

## Course Policies

**Main Lectures** Main lectures are held twice a week unless otherwise announced:

- **Section A:** MF 09:30–10:20, Tech Sq Research Bldg Room 132
- **Section B:** MF 11:00–11:50, Molecular Sciences and Engr Room G011

The purpose of the main lectures is to inform students of the broad view on topics being covered each week, motivate each topic, and introduce the major components for developing deeper understanding of the course material. **Attendance is important** and a critical part of being able to perform well in the course.

**Recitations** Recitations are held each week unless otherwise announced. See the weekly recitation schedule on Canvas. The purpose of recitation is to solidify problem-solving skills, answer questions, and facilitate deeper personal interaction with a teaching fellow. **Participation is expected** at each recitation; recitation instructors are responsible for 5% of your grade. Discuss grading expectations with your recitation instructor.

**In-Class Activities** We will use **Point Solutions Technologies** for interactive in-class activities during main lectures throughout the semester. You must use the Point Solutions app or the web interface. Downloads are available at:

- iOS:https://apps.apple.com/us/app/pointsolutions/id300028504

- Android:https://play.google.com/store/apps/details?id=com.turningTech.Responseware
- Desktop:https://support.echo360.com/hc/en-us/sections/17524318967949-PointSolutions-Desktop-App

**You are expected to bring your laptop or other mobile device to every class period.** All activities are tabulated at the end of the semester and count for 5% of your grade. Earning credit for 90% or more of in-class activities earns the full 5%. Below 90%, the grade is calculated proportionally (e.g., 70% of activities $\Rightarrow 0.70 \times 5\% = 3.5\%$). *Forgetting your device is not an accepted excuse and your participation that day cannot be recorded.*

**Laboratory (Klaus 2440)** Labs will be assigned approximately every two weeks and students will have approximately two weeks to complete them. Check Canvas for assignment and due dates. You may bring your own laptop provided all necessary software (primarily MATLAB) is already installed; otherwise use the desktop machines in the lab.

**There will be no lab meetings during the first week of class**

The laboratory explores hands-on applications of course concepts using MATLAB. Each lab will have verification/check-offs that must be shown to an instructor during an assigned lab time. Instructors may ask questions to verify your understanding before providing verification.

Labs are an essential element of the course. If you miss a lab for any reason, you **must** contact your lab TA and instructor within one week to arrange a make-up. **All labs are mandatory.** Any student with a missing lab assignment may receive a final course grade of **Incomplete** or **F** until all lab assignments are resolved.

**Homework** Written homework will be assigned approximately weekly and will be due at the times indicated on the assignment. Solutions will be posted on Canvas. **Late homeworks will not be accepted.** All homework is submitted through the Gradescope module on Canvas. Video tutorials on submissions can be found at:
https://www.gradescope.com/get_started#student-submission

**Absences** Class attendance is expected. For Institute policy on absences for illness or personal emergencies, see:
http://www.catalog.gatech.edu/policies/student-absence-regulations

For **illnesses**, students are responsible for providing documentation to the Office of Student Life, where it will be treated confidentially and forwarded to instructors as needed.

For **personal emergencies**, contact the Office of the Dean of Students at (404) 894-6367 or submit a form at:
https://studentlife.gatech.edu/content/class-attendance

For **institute-approved activities**, provide an approval letter obtained from:
https://registrar.gatech.edu/info/institute-approved-absence-form-for-students

When properly documented, any of the above constitutes an **excused absence**. Please inform Prof. Moore (em80@gatech.edu) and Prof. Juang (juang@ece.gatech.edu) and your recitation instructor without providing any confidential information. If an excused absence involves a missed **exam**, coordinate with both professors to determine an appropriate grade replacement. In most such circumstances, your next exam score will be used to provide a rank-ordered equivalent score for the missed exam.

**Student Collaboration** Students are encouraged to study together and to openly discuss course topics. However, each submitted assignment must reflect the work of the individual student. No copying of work from other students is allowed; such activity constitutes a violation of the Honor Code. If you are uncertain about the nature of a collaboration you are involved in, contact an instructor for guidance.

**Academic Honesty** All violations of the Georgia Tech Honor Code will be referred directly to the Dean of Students for investigation and penalties. Past infractions have included cheating on tests, copying lab results, copying homework, and forging TA verifications. You are **not permitted** to complete any in-class exercises or attendance verifications for another student. Violations of the Honor Code carry a **minimum** penalty of a drop of one letter grade in the final course grade and potentially academic probation.

**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. Unauthorized use of any previous semester course materials (tests, quizzes, homework, or other coursework) is prohibited and constitutes a direct violation of the GT Academic Honor Code. Publicly sharing materials from this semester (e.g., test banks, CourseHero, or similar sites) is also prohibited. Any student suspected of cheating or plagiarizing will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty.

**Accommodations for Students with Disabilities** If you are registered with the Office of Disability Services (ODS), please inform Prof. Moore, Prof. Juang, and your recitation instructors as soon as possible. The instructors will abide by all ODS accommodations. The exam schedule is posted in this syllabus; any modifications will be given with at least one week's notice. **It is the student's responsibility** to arrange test accommodations for each exam with ODS in sufficient time to guarantee space for exam administration. **All exam accommodations must be handled through ODS.** Students who do not register accommodations with ODS prior to an exam will take it at the normally scheduled time without additional accommodation, unless ODS provides specific directive to instructors on the student's behalf.

**Office Hours** Times and locations for office hours will be posted on Canvas when available. You are welcome to attend the office hours of any staff member, including TAs.

**Student-Faculty Expectations Agreement** At Georgia Tech, we believe 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 us and that we have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. We encourage you to remain committed to the ideals of Georgia Tech while in this class.