

# ME 4405 - Fundamentals of Mechatronics

Course Syllabus

Fall Semester 2026

## 1 Class Schedule

Lecture 8:25 - 9:15 AM Monday and Wednesday, TBD

The mechatronics lab is located in the College of Computing Building Room 031

## 2 Teaching Team

Prof. Tony Chen, Assistant Professor, ME, Georgia Tech  
Office Hours: 9:15 AM M/W, GTMI 438, after lecture.  
Students can request remote meetings on Microsoft Teams.  
Email: [tonygchen@gatech.edu](mailto:tonygchen@gatech.edu)

TA: TBD  
Office Hours: TBD

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Office Hours: TBD

### 3 Course Overview

This course introduces students to microcontrollers and hardware control of mechanical devices. Course modules will focus on microcontroller interfacing, mechanical actuators, sensors, feedback control, and system modeling. Through lab exercises and a final project, students will gain practical experience designing and constructing all aspects of mechatronics systems. The programming language for this course is C, and the microcontroller is a STM32 Nucleo-L476RG.

### 4 Learning Objectives

1. Students will learn how to interface a microcontroller with real-world hardware, including: embedded C programs, serial communication, analog-to-digital conversion, interrupts, and timers.
2. Students will know how to select and interface with sensors. They will be comfortable parsing a sensor datasheet for relevant information, identify sensor signal characteristics, and learn basic filtering techniques for signal conditioning.
3. Students will demonstrate how to interface with a variety of actuator devices, including brushed DC motors, stepper, and servo motors. They will also be able to control these actuators using pulse-width-modulation and H-bridge circuits.
4. Students will learn how to tune and apply a PID controller to provide basic feedback control to a mechatronic system.

### 5 Required & Optional Course Supplies

This course will require that every student purchase a robot kit and electronics hardware needed for the lab curriculum. Purchasing the STM32 microcontroller is optional, but recommended (the microcontrollers will be available in lab to borrow). The STM32 will be needed for Lab 1 , and the rest of the supplies are needed for Lab 4. The purchase list is below, and starting Spring 2026, the Invention Studio is stocking the Elegoo Robot Kit along with STM32s. Their store hours is 11AM to 4PM Monday through Fridays.

Qty	Req'd?	Hyperlink	Item	Cost
1	Req'd	<a href="https://a.co/d/ihDOKNA">https://a.co/d/ihDOKNA</a>	Elegoo Robot Kit	\$84.99
1	Req'd	<a href="https://a.co/d/9yLkgK2">https://a.co/d/9yLkgK2</a>	Electronics Fun Kit	\$15.99
1	Req'd	<a href="https://a.co/d/gvKwIvv">https://a.co/d/gvKwIvv</a>	Mini USB cable	\$6.93
1	Optional	<a href="https://a.co/d/fYpIwdQ">https://a.co/d/fYpIwdQ</a>	Jumper Wires Kit	\$7.99
1	Optional	<a href="https://a.co/d/5j9vXBs">https://a.co/d/5j9vXBs</a>	STM32 Nucleo L476RG	\$24.00

While not mandatory, it is recommended that students install the STM32CubeIDE software on a personal laptop (Windows/Mac/Linux friendly). This will help students follow

along during lectures and complete assignments at home. All computers in the mechatronics lab (CoC Building room 031) will have STM32CubeIDE installed. Instructions on STM32CubeIDE installation will be provided on Canvas.

## 6 Course Format

- Course content for ME 4405 will be disseminated in-person during lecture, twice a week. Lecture format will be a combination of lecture slides and interactive work. While I will not be taking class attendance, we will be covering the content needed for completing labs. Not attending lecture will make the lab assignments significantly harder.
- Lecture slides will be posted to Canvas before each class.
- **Course assignments:** There will be 8 lab assignments throughout the semester and a final project with 4 associated assignments. There will be no quizzes or final exam.
- All lab assignments will be due at the end of your respective lab slot.

### 6.1 Lab assignments

- All lab assignments are individual.
- **It is expected that students work on the lab assignments prior to the assigned lab slot.** The labs are considered as both homework and lab work, and can be entirely completed at home.
- Lab assignments can be turned in early during TA and instructor office hours (not other lab sections!). If labs are turned in early, the student does not need to attend the lab section.
- Students will be provided Buzzcard access to the Mechatronics Lab (CoC 031). The lab can be accessed at any time, other than the assigned lab slots listed on page 1.
- Labs will be due by the end of your assigned lab slot. If a lab is checked-off past the end of the lab slot, it will be considered late, even if the TA is still present in the lab. Lab assignments will be structured so individual components are assigned point values.
- **If a student is unable to complete a lab task on time, they have the option of completing that task at any point the rest of the semester for 70% of the credit.** For example, if you only received 60/100 points in a lab, you could complete the rest of the lab at any point and receive a lab score of 60 points +  $(0.7 \cdot 40 \text{ points}) = 88$  points. Deadline for final submission is July 25th, the final reading day of the semester. following your lab period.

## 6.2 Final project

- The final project can be completed in a team of 3 to 4. Larger teams will require a more complicated project.
- In the final project, students will combine concepts learned throughout the course with a new mechatronics concept of their choosing.
- The final project presentation will be in lieu of a final exam (it is an “alternative final”). There will be no final exam for the course.
- Details on the final project and its associated deliverables will be provided in the Final Project documentation on Canvas.
- While there will be minimum requirements for your project, your team will also be graded on complexity and creativity.
- Some hardware and prototyping supplies will be available in the Mechatronics lab. Students will be responsible for purchasing their own hardware outside of these supplies.

## 7 Team Dynamics and Peer Review

- If there are notable issues with the final project team, reach out to the instructor.
- There will be a peer review after the final project. The peer review will have three categories: satisfactory, deficient, and minimal contribution. The instructor will investigate negative ratings and points may be deducted from an individual’s final project score due to poor team performance or lack of contribution. Additionally, positive ratings will be considered in borderline grade cases at the end of the semester.

## 8 Additional Instruction

Supplemental instruction by the instructor or TA is a valuable resource available to any student having difficulty with a particular concept in the course. Get help when you have a problem! Be prepared to ask specific questions that concisely articulate unclear concepts.

## 9 Course Textbook

There is no official course textbook. However, the following books may be useful as a reference throughout the course:

- Ibrahim, D., Programming with STM32 Nucleo Boards, Elektor, 2014 (available with the Nucleo-L476RG at: <https://www.sparkfun.com/products/18005>).

- Jouaneh, M., Fundamentals of Mechatronics, Cengage Learning, 2013 (available from Amazon.com), ISBN 978-1-111-56901-3

Note that it is not required that students purchase these books.

## 10 Grading

Grades will be determined based on demonstrated proficiency on labs and a final project. The points associated with each graded event are shown below along with the associated letter grade. Note that this course is not graded on a curve.

### Point Breakout:

Lab Assignments = 700 points

Final project = 300 points

**Total = 1000 points**

### Grading Scale:

A = 900 - 1000 Total Points

B = 800 - 899 Total Points

C = 700 - 799 Total Points

D = 600 - 699 Total Points

F = 0 - 599 Total Points

## 11 Class Policies

**Attendance:** While in-person lecture attendance will not be required, it is highly recommended you attend each lecture. Lecture slides will be posted on Canvas. **Attending lecture in-person will make the laboratory assignments significantly easier.**

Students with disabilities will receive necessary accommodations. For details, please refer to the GT Disabilities Services' "Policies and Procedures" page located at this link:

<http://disabilityservices.gatech.edu/content/15/policies-procedures>.

## 12 Academic Dishonesty

Students are expected to uphold high ethical standards including adherence to Georgia Tech Academic Honor Code (which can be found in the course catalog).

You are permitted and encouraged to seek the advice of others. However, there is an obvious difference between a constructive discussion about a lab problem with a classmate and copying a classmate's work or code. Copying is not permitted. Any help/advice you receive must be fully documented so that you do not falsely represent yourself and your work.

**If you are not sure about whether a particular action could be considered plagiarism or academic dishonesty on your part, then ask the instructor.**

## 13 GT Honor Code

Georgia Tech Honor Challenge Statement: I commit to uphold the ideals of honor and integrity by refusing to betray the trust bestowed upon me as a member of the Georgia Tech community. The honor code policy can be found at <http://policylibrary.gatech.edu>

## 14 Health and Well-Being

Georgia Tech values the complete well-being of all members of its community, which includes professional, physical, spiritual, emotional, and social dimensions. There are numerous resources to support the mental health of all members of our community.

As a matter of policy, Georgia Tech is committed to equal opportunity, a culture of inclusion, and an environment free from discrimination and harassment in its educational programs and employment. Georgia Tech prohibits discrimination, including discriminatory harassment, on the basis of race, ethnicity, ancestry, color, religion, sex (including pregnancy), sexual orientation, gender identity, national origin, age, disability, genetics, or veteran status in its programs, activities, employment, and admissions.

<http://policylibrary.gatech.edu/equal-opportunity-nondiscrimination-and-anti-harassment-policy>

## 15 Assignment Extensions

If the student requires a lab assignment extension due to being sick (or other extenuating circumstances), the student must submit the required paperwork to the Dean of students, found here:

<https://studentlife.gatech.edu/about/dean-students>.

A one-week extension will be granted once the letter has been received from the Dean of Students. Otherwise, late lab tasks will follow the course policy of 70% credit (see section 7.1).