CS 3651 Syllabus

Prototyping Intelligent Devices, All Sections, 4 Credits
Fall 2026

Instructor Information

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General Course Information

Description

CS 3651 Prototyping Intelligent Devices is designed to provide practical, hands-on experience for electronic device prototyping and development. The course material focuses on elementary electronic skills building, microcontroller firmware development, simple physical prototyping, and inventive problem solving. The course is lab-based (referred to as skill demos) with an open-ended final project.

Skill Demonstrations

These tasks are in-class exercises that demonstrate understanding of the concepts learned from in-class lectures or assigned readings/videos. Some skill demos will be knowledge based, while others will focus on hands-on skills with electronic components. Each skill demo will be signed off by either an instructor or TA when completed.

The assignment details and due dates of each skill demonstration will be indicated in Canvas, but they will run approximately one per week for the first part of the course. Some skill demos will require submission via Canvas, but most will be checked off by an instructor or teaching assistant during class or office hours via a physical sign-off sheet or entered directly into Canvas. Additional check-off times may be arranged at our discretion via email.

If you don't complete a skill demonstration before the due date, you can still get credit for it with a penalty. See the late work policy below.

Semester Project

In this class, you will complete a project either solo or in a group of up to two people. You will propose a project and work with us to negotiate goals that are challenging but still feasible within the semester. Be aware that some of the materials for this project may need to be purchased by your group.

The goal of the project is to demonstrate some of the skills that you have learned in the class and to teach you to design a complete system with mechanical, electrical, and software components. More details on the project will be provided before the withdrawal deadline.

As reflected in the course grade breakdown, you will be graded on your project itself, as well as a presentation given during the finals period, and a write-up to be submitted with the project.

Learning Outcomes

Learn basic electronics including how to apply Ohms Law, calculate power usage, and implement Kirtchhoff's circuit laws.

Learn how to calculate equivalent resistance and capacitance for resistors and capacitors in series and parallel.

Develop the ability to implement electronic circuits from representative schematics.

Learn how to write and execute embedded code on a microcontroller.

Through in-class labs, demonstrate an understanding of

- How to capture and evaluate digital and analog signals.
- Concurrent techniques for real-time processing such as the use of interrupts.
- Generate time-varying digital signals including pulse width modulation.
- Control motors including DC, stepper motors, and RC servos.
- Use communications protocols to communicate between devices.
- Design a 3d object with CAD software and create it with a 3d printer.
- Design an object and create it with a laser cutter.

Implement a project that demonstrates understanding of the learning outcomes by:

- Conceiving of a device and researching similar creations.
- Implementing the electronics, operational physical design, and firmware.
- Building an appropriate enclosure.
- Performing a live demonstration of the device.

Required Course Materials

Instead of a book, you will need to purchase an electronics kit to implement the skill demos in class (cost less than $100). The specific kit we use will be announced on the first day of class.

For the semester project, you may choose to augment the parts in your kit with additional components that you purchase.

Grading Policy

Letter grade assignments are earned according to the following cutoffs with no rounding:

- 90.0 <= A
- 80.0 <= B < 90.0
- 70.0 <= C < 80.0
- 60.0 <= D < 70.0
- 0 <= F < 60.0

Description of Graded Components

47% Skill Demos

Much of the course will focus around applying the lessons learned from readings and other pre-class learning activities. These skill demonstrations will be assigned in class and will be due by the end of office hours on the date indicated.

Skill demos can be turned in late; see the late work policy below.

3% Quizzes

Quizzes: There are announced open-book open-note quizzes totaling 3% of the grade.

There may be one or more quizzes (announced or unannounced) that will be graded and included as a skill demo.

50% Class Project

The latter segment of the course will focus on the completion of a group project that relates to the materials covered in this course. This includes deliverables for planning and documenting your project.

Late Policy

Skill demos are due on the day that they are due in Canvas. They can be turned in late with a penalty of 10% per class period that they are late, up to a maximum of 3 class periods late. All skill demos must be turned in before the last day of class.

Project deliverables are due by midnight the day before we hold in-class reviews. You must deliver these on time to move forward on the project.

The final project demo and documentation are due at the beginning of the finals period for your class. There is no late submission. Failure to demonstrate the project by the finals period will result in failing the class.

Exceptions to this policy are not generally allowed without prior approval of the instructor or TA, or an approval from the Dean of Students office.

Timely handling of grade disputes

Disputes of grading on assignments, projects, etc. must be presented via email to the instructors (not just discussed in person) within two weeks of the grade posting.

Course Policies

Attendance and/or Participation

Attendance is expected but not tracked. Most class days will include a lecture that will be necessary to implement a skill demo. We do not provide video lectures except under extraordinary circumstances (eg: an Institute snow day). As a lab class, you will not pass without attending your class section to receive lab signatures.

Academic Integrity

All students in the class are expected to know and abide by the Georgia Tech Academic Honor Code. Specifically, for this class, plagiarism is defined as the "submission of material that is wholly or substantially identical to that created or published by another person or persons, without adequate credit notations indicating the authorship."

In this class we expect that you will refer to and use existing publicly accessible resources (eg: code on GitHub, Arduino libraries, tutorials, circuit designs, forum posts). So long as you credit your sources, that is usually fine, and we'll discuss any special circumstances. Include a link to the original source of the code or design and clearly note where the copied section begins and ends.

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 your instructor 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.

Pre- &/or Co-Requisites

ECE 2031 or equivalent experience reading schematics and implementing circuits is required before taking the course. See https://registrar.gatech.edu/registration/permits-and-overloads for information on contacting the College of Computing to request an override.

Collaboration, Group Work, and Use of Generative AI

Collaboration with other students for skill demos is expected and encouraged, but all code written, wires plugged into breadboards, designs created, etc. must come from yourself. If you find a library or resource (for example: an Arduino library) that seems to make the skill demo 'too easy' (i.e. if using the resource prevents you from learning the intended skill), please let us know. Some guidelines are:

DO discuss the course material with your peers.

DO give suggestions to other students.

DON'T make any electrical connections for other students.

DO discuss overall code structure.

DO discuss resources you used.

DON'T copy code from other sources verbatim.

DO give advice to other students on 3D printing and laser cutting.

DON'T design or fabricate physical parts for other students.

We view the usage of AI as equivalent to collaboration with a human and we expect you to follow the same guidelines you would when obtaining help from another person. Consider it a source of assistance but not code you should cut and paste and present as your own. We do ask that if you do use AI, you tell us the prompts you used to generate the responses. We understand that AI is fast becoming an invaluable tool**,** but we also need to make sure that you learn how to implement the algorithms we present. During signoffs we

will be asking you about details in your code and how it works. If it is apparent that you do not understand the code, we may have you erase it and start again.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Late homework will be penalized accordingly. Make-up exams are given for illness, approved Institute activities or religious observances.