

ECE 198: Project Studio¹

Fall 2021

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1 Overview

Welcome to the University of Waterloo and welcome to the first-ever iteration of ECE 198! We're excited about this course and making sure that you all have the opportunity to succeed and learn something.

In this project course, you will work on your software skills by designing and building a software project that runs on an ARM-based microcontroller and interfaces with hardware. We will propose sample project ideas, but we are also open to ideas that you may bring. The point is to put together a modest system that you decide on and implement, in a small team, using modern software development techniques.

There are no assignments, lectures, or labs. Instead, you work on a project that takes the entire term to complete. You will submit a project proposal for feedback at the start of the term, submit a design document about half-way through the term, and do a final demo at the end of the term.

About course outlines. Every university course comes with a course outline, or syllabus. It contains key information about course contents, deliverables, and deadlines, and serves as a contract between the instructors and students. In particular, instructors cannot deviate from the terms of the course outline without the permission of the class. (Unless there is an unforeseen event, e.g. a pandemic.)

Learning Objectives. After completing this course (as well as ECE 190), you will have a basic knowledge of the following:

- How to develop a complete project from scratch.
- How to apply engineering design practices.
- How to apply project management techniques.
- How to develop software for a microcontroller board.
- How to use an Integrated Development Environment (IDE).
- How to use source code management software (i.e. version control).

In addition, you will be required to complete your Workplace Hazardous Materials Information System (WHMIS) certification.

How this course works. We want you to be autonomous in choosing and building your projects, with help from the instructional team as needed. Concretely, that means that we'll be sending you weekly email communications. We'll also be there to help you work through issues that you encounter, from project selection through to design and implementation. But staying on track is your responsibility; we'll provide hints about where you should be, but we're not going to look over your shoulder.

Resources. There is a lab manual for this course, available on LEARN. It amplifies the information in this syllabus.

¹rev 0.91: almost initial version: need to add office hours and clarify inter-course synchronization

Cross-curriculum linkages.

- Apply programming knowledge from ECE 150;
- Apply communication skills from ECE 190 (joint evaluation of some deliverables);
- Provide hardware and software commonality with ECE 298.

WHMIS Course. The WHMIS course described in the lab tutorials can be taken entirely online. Go to <https://uwaterloo.ca/safety-office/training/whmis-2015> and follow the instructions to take the course through LEARN. Completing your WHMIS training is a requirement of ECE 198. If you don't complete it, you'll get an INC (incomplete), and will have to complete it before you get a mark for this course.

2 Course Information

Course announcements will be made on LEARN, but you'll also receive official communications from us in your email.

Course staff.

Lab Instructor	Bernie Roehl, bernie@uwaterloo.ca
Drop-in Hours:	MS Teams; Mondays 3:30-5:30, Wednesdays 8:30-11:30
Assistant Lab Instructor	David Lau, david.lau@uwaterloo.ca
Drop-in Hours:	MS Teams; Mondays 3:30-5:30, Wednesdays 8:30-11:30
What to call me:	"Dave" or "David" are fine.
What not to call me:	"Professor" or "Professor Lau", as I'm not a professor.
Instructor	Patrick Lam, patrick.lam@uwaterloo.ca
Drop-in Hours:	MS Teams; Wednesdays 16:00–17:00, or by appointment
What to call me:	"Patrick," or if you must: "Prof. Lam," or "Dr. Lam."
What not to call me:	"Mr. Lam"
Instructor	Rodolfo Pellizzoni, rpellizz@uwaterloo.ca
Drop-in Hours:	MS Teams; Thursdays 17:00–18:00, or by appointment
What to call me:	"Rodolfo"
What not to call me:	my last name is unpronounceable in English
Teaching Assistants	[your first point of contact for project-related questions]
Groups 1 to 45	Francis Allannah, fallanah@uwaterloo.ca
Groups 46 to 90	Harish Ganesan, higanesa@uwaterloo.ca
Groups 91 to 135	Rodrigue De Schaetzen, rdeschae@uwaterloo.ca
Groups 136 to 180	Sangar Sivashanmugam, s2sivash@uwaterloo.ca
Groups 181 to 225	Sohrab Samiezadeh, ssamieza@uwaterloo.ca

Getting help. This term we'll be using Piazza for general discussions. To join the Piazza for the course, follow this link: <https://piazza.com/uwaterloo.ca/fall2021/ece198>. We encourage you to engage actively on Piazza: ask and answer questions and learn from what your peers are saying.

This course has 2 hours of scheduled labs per week per section in the WEEF lab (E2-1792). You can book a physical or virtual TA consultation during these hours. You will receive a booking link for

appointments from your TA. Due to capacity limits, you *must* schedule your help session ahead of time and may *not* enter the room prior to your scheduled time slot.

The instructors have also set aside time specifically to meet with you in the form of online “office hours” or “drop-in hours” where you can drop in to ask questions. We are happy to meet with you and encourage you to make appointments at other hours if they work better for you. Instructor appointments will primarily be virtual this term.

We strongly recommend vaccination for all, and proof of vaccination is now required to go to campus and talk to instructional staff in person. For the vast majority of you who are in Canada, excellent vaccines are available to you, and they are your best chance to avoid an otherwise inevitable COVID-19 infection (you don’t want that; there is no upside). We understand that some of you may be in more complicated situations and we still recommend vaccination as soon as possible.

Textbook. None.

Lab tutorial videos. We have recorded the following instructional videos to help you with your project. We will be releasing them in three batches throughout the term, close to when we expect you would need them.

1. Introduction
2. Choosing a Project
3. Project Proposal
4. WHMIS
5. How to Succeed
6. Engineering Design
7. Hardware Setup
8. Software Setup
9. Using Git
10. Adding Hardware
11. Pins and Ports
12. Design Document

Hardware. We’ll be using the STM32 Nucleo boards. These are the same boards that will be used in ECE 298 starting in the Spring term, and you may also find them useful in other courses (e.g. the Design Project in ECE 106 taken in 1B). You can purchase the boards and adapter cables through The Bookstore. This board is cheaper than a textbook; there’s no textbook for this course.

Software stack. We require the use of VS Code with the PlatformIO plugin. VS Code is a modern IDE with code completion and integrated debugging, and PlatformIO provides good support for STM32. VS Code also works well with git. This IDE will also be used in ECE 298.

Deliverables. We’ve designed this course to eliminate high-work low-reward activities (also known as “busywork”). There are three deliverables, one near the end of each month:

- A project proposal, to ensure that your project is appropriately scoped.
- A design document that builds on the proposal, where you outline your proposed implementation and describe what you’ve done so far to prototype your project. This is an opportunity to demonstrate good engineering design processes and written communication skills. We will provide guidance on what should be in the design document.

- A final demonstration of the project, demonstrating good verbal communication skills. There will be no final written report.

The lab manual will provide more details about what we're looking for. We will also provide a sample proposal. The project proposal will be harmonized with ARTS 190: you can submit the same document for both courses.

You will hand in your proposal and report on LEARN, and you will push the code for your project to a git repo that we will create for you. To do so, you will need to make an account on `git.uwaterloo.ca`. We will teach you how to make an SSH key so that you can commit your work to the repo.

Teams. We are recommending groups of two. In rare cases, we may accept a group of three. There is no such thing as a “group of one”. However, if your circumstances are truly exceptional, contact us and we can discuss it.

You will be assigned to 4-person groups in ECE 190 which will be matched by time zone and other factors. You may want to form your ECE 198 groups as subgroups of your ECE 190 groups. However, if you are having trouble forming a group, you can post on our discussion forum. If you have not formed a group by September 15, you will automatically be assigned to one (fair warning: it will not take time zones into account).

About the demo. As of this writing, the epidemiological situation for end of term remains unclear. We will provide precise specifications later in the term. What we know is that you will have a 15-minute session with instructional staff. There will be some sort of demo and you will have a Q&A session. We expect that both partners be reasonably familiar with the project and able to answer at least basic questions about the project; we may adjust marks if that is not the case. There will definitely be a remote participation option; we are unsure yet about whether there will be an in-person option.

Grading Scheme.

- Project proposal (Sep 21 draft/Sep 28 final): 10%
- Design document (Nov 2): 60%
- Prototype demo (around Nov 23): 30%

Based on your project proposal, we will determine if your project is “easy”, “moderate” or “challenging”. The process is as follows. You submit anonymized draft proposals. We circulate these proposals and assign your group two other proposals to rate. We take this input into account and tell you which difficulty category we consider your project to fall into, both after your draft proposal and again after your revised proposal. If you do not submit a draft proposal on time, course staff will evaluate your difficulty rating and we will lower your difficulty rating by one notch.

If you choose an easier project, our expectations will be higher. In other words, if you set yourself a low bar, then we expect you to clear it. Additionally, an “easy” project can earn at most 65% of the prototype demo points, “moderate” at most 80%, and “challenging” at most 95%. It is possible to earn 100% for the prototype demo by executing an exceptionally challenging project, but we strongly advise against aiming for such a project, and point out that your time is likely best spent on other courses.

If the project you actually end up doing turns out to be either more challenging or less challenging than what you said you would do, the TA will revise their estimation of your project category.

Collaboration. Different courses have different policies about collaboration: it is important to pay close attention. If you violate a course collaboration policy, it might be considered plagiarism and reported to the Associate Dean.

In ECE 198, you are expected to collaborate within your group. Between groups, you may discuss ideas, design alternatives, and help each other debug small fragments of code.

However, each group must write their own code. To be precise, teams are not permitted to share code electronically or in written form. We will be using automated code-comparison tools, so if two groups are doing similar projects with very similar code, that will be flagged for investigation. You don't want that. The safest thing for you to do is only work with groups whose project is nothing like yours, and avoid looking at code from groups that are working in areas similar to yours.

Think of it this way—if you're working for a company, you will often bounce around ideas with your colleagues, get them to try out your code, and even get their help with debugging if you're stuck. All of that is fine in the workplace. However, taking their work and passing it off as your own is not okay. It's not okay in the workplace, and it's not okay in this course.

3 Schedule

We encourage you to work on your project through the term, although you may need to learn content in ECE 150 before you can implement it in your project.

Week 1	Tue Sep 7	Classes begin
Week 3	Tue Sep 14	Form groups
Week 4	Tue Sep 21	Submit draft proposal
Week 5	Tue Sep 28	Submit final proposal
Week 8	Tue Nov 2	Submit design document
Week 12	Tue Nov 23	Final project demos

You can push any *one* of your due dates by *one* day. However, the interactive portion of your demo cannot be moved once it's been scheduled. If you do not submit a deliverable on time (including late days), you will get 0% for that deliverable, unless you have a documented illness. But please talk to us, or to the First Year Engineering advisors, before it gets to that.

4 Illness

As the pandemic continues, unpredictable events may occur. Fortunately, since this instance of ECE 198 is a hybrid online/in-person course, we anticipate that it will be mostly unaffected by the epidemiological situation. Here are some things that may happen:

- University goes fully online: no changes except that your consultations with TAs during lab sessions will be exclusively remote.
- Instructor/lab instructor/TA must self-isolate/is ill: we will redistribute the workload and support the ill person in their recovery.
- Student is ill: You have one day of flexibility as outlined above, and you have a lab partner. Still, please talk to us, we'll work something out.

5 University Policies

Academic integrity:	http://uwaterloo.ca/academicintegrity/
Petition & Grievance:	http://secretariat.uwaterloo.ca/Policies/policy70.htm
Discipline:	http://secretariat.uwaterloo.ca/Policies/policy71.htm
Penalties:	http://secretariat.uwaterloo.ca/guidelines/penaltyguidelines.htm
Appeals:	http://secretariat.uwaterloo.ca/Policies/policy72.htm
AccessAbility:	https://uwaterloo.ca/disability-services/