ECE295H1 S

HARDWARE DESIGN AND COMM.

Winter 2025 Syllabus

Course Meetings

ECE295H1 S

Section	Day & Time	Delivery Mode & Location
LEC0101	Monday, 9:00 AM - 10:00 AM Thursday, 10:00 AM - 11:00 AM	In Person: WB 116 In Person: MB 128

Refer to ACORN for the most up-to-date information about the location of the course meetings, including PRA and TUT sections.

Labs and tutorials begin the first week of class. Please refer to the Quercus site for details.

Course Contacts

Instructor: Prof. Sean Victor Hum
Email: sean.hum@utoronto.ca
Phone: (416) 946-3653
Office Hours and Location: BA5122. For office hours, see Quercus.

Instructor: Matt Strohack
Email: m.strohack@utoronto.ca
Office Hours and Location: See Quercus.

Course Overview

Introduction to engineering design processes for hardware systems. In addition to familiarizing students with hardware design practices, tools, and skill sets, it also aims to develop effective oral and written communication in a team context. Principles of engineering design, project management and teamwork are developed and applied as students work in teams to create and implement a complex hardware system comprising analog and digital electronic circuits. Students learn how to synthesize, prototype, and assemble designs realized using printed circuit board technology, as well as how to test them using modern measurement equipment. They learn about computer-aided design (CAD) and other development tools including those for electronic circuit simulation, schematic capture, board layout, version control (git), and instrument control. Students develop and apply communication skills by preparing a variety of documents and presentations, including proposals, status reports, design reviews, and presentations.

Course Learning Outcomes

By the end of this course, students will be able to:

- Work in a team environment in developing a complex hardware project;
- Interpret design specifications and translate them into a design that attempts to achieve them;
- Be familiar with agile methods in hardware development, and apply ideas from these methods in their own design process with their team;
- Demonstrate proficiency using computer aided design (CAD) and electronic design automation (EDA) techniques for hardware development, in particular, schematic capture and printed circuit board layout tools;
- Demonstrate ability to solder components, familiarity with surface-mount technology, and awareness of the restriction of hazardous substances directive (RoHS);
- Be familiar with electrostatic discharge (ESD) handling guidelines and protection;
- Confidently use using laboratory instruments and apply them for testing circuits and systems;
- Assemble instruments and controlling software for the purpose of automated hardware testing (test automation);
- Be aware of standards and regulatory compliance when pursuing industrial design; and
- Demonstrate confidence preparing oral presentations and written documents on technical engineering hardware design.

Prerequisites: ECE231H1, ECE241H1, APS105H1
Corequisites: ECE212H1
Credit Value: 0.5
Graduate Attributes:

- 4B. Design: Demonstrate ability to generate a diverse set of candidate engineering design solutions. [Applied] **Measured in Course**
- 5B. Use of Engineering Tools: Demonstrate ability to use discipline specific techniques, resources and engineering tools. [Applied] **Measured in Course**
- 6C. Individual and Team Work: Demonstrate success in a team based project. [Applied] **Measured in Course**
- 7A. Communication Skills: Demonstrate the ability to identify and credibly communicate engineering knowledge. [Applied] **Measured in Course**
- 7B. Communication Skills: Demonstrate the ability to use different modes of communication. [Applied] **Measured in Course**
- 8C. Professionalism: Demonstrate the ability to behave in a professional manner. [Applied] **Measured in Course**

Marking Scheme

Assessment	Percent	Details	Due Date
Myhal Online Safety Training	1%	Assessed by Myhal staff	2025-01-06
Written Document 0 (WD0)	5%	Assessed by CIs	2025-01-24
Technical Milestone 0 (M0)	4%	Assessed by TAs	2025-02-10
Written Document 1 (WD1)	10%	Assessed by CIs	2025-02-10
Oral Presentation 1 (OP1)	14%	Assessed by CIs	2025-02-24
Technical Milestone 1 (M1)	20%	Assessed by TAs	2025-02-24
Technical Milestone 2 (M2)	5%	Assessed by TAs	2025-03-10
PCB submission deadline	0%		2025-03-16
Technical Milestone 3 (M3)	20%	Assessed by TAs	2025-04-01
Oral Presentation 2 (OP2)	19%	Assessed by CIs and TAs during the exam period	2025-04-30
Participation and professionalism	2%	Assessed by CIs	2025-04-07

ECE295 is a milestone-driven course with a variety of written and oral milestones due throughout the term.

You are expected to meet each week with your TA and CI where you will present a written status update on your team's wiki page. These updates will be used as a project management tool throughout the course and will factor into your professionalism grade, as well as your milestone grades.

Late Assessment Submissions Policy

If you are unavoidably absent and miss term work (e.g. test, quiz, assignment, lab), discuss the matter with your instructor immediately. If necessary, submit a term work petition. All term work petitions must be submitted through the online petition system, which is accessible through the Engineering Portal. Term work petitions must be submitted within seven days of the term work in question and include valid documentation (see https://undergrad.engineering.utoronto.ca/petitions/term-work-petitions/ for more details).

Policies & Statements

University Land Acknowledgement

I wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

Learn more about Canada's relationship with Indigenous Peoples here.

Indigenous Students' Supports

If you are an Indigenous engineering student, you are invited to join a private Discord channel to meet other Indigenous students, professors, and staff, chat about scholarships, awards, work opportunities, Indigenous-related events, and receive mentorship. Email Professor Bazylak if you are interested.

Indigenous students at U of T are also invited to visit Nations House's (FNH) Indigenous Student Services for culturally relevant programs and services. If you want more information on how to apply for Indigenous specific funding opportunities, cultural programs, traditional medicines, academic support, monthly social events or receive the weekly newsletter, go to the FNH website, email or follow FNH on social media: Facebook, Instagram, or TikTok. A full event calendar is on the CLNX platform. Check CLNX often to see what new events are added!

Wellness and Mental Health Support

Your personal wellness and mental health are important. The University of Toronto and the Faculty of Applied Science & Engineering offer a wide range of free and confidential services that can support your well-being.

As a U of T Engineering student, you have a Departmental Undergraduate Advisor or a Departmental Graduate Administrator who can support you by advising on personal matters that impact your academics. Other resources that you may find helpful are listed on the U of T Engineering Mental Health & Wellness webpage, and a small selection are also included here:

- U of T Engineering's Student & Community Wellness Coordinator
- Health & Wellness and the On-Location Engineering Wellness Counsellor
- Health & Wellness Peer Support Program
- Accessibility Services & the On-Location Advisor
- Graduate Engineering Council of Students' Mental Wellness Commission
- SKULE™ Mental Wellness
- U of T Engineering's Learning Strategist and Centre for Learning Strategy Support
- Registrar's Office and Scholarships & Financial Aid Office & Advisor

We encourage you to access these resources as soon as you feel you need support; no issue is too small. You may reach out to the counsellors at U of T Telus Health Student Support for 24/7 free and confidential counselling support.

If you find yourself feeling distressed and in need of more immediate support visit uoft.me/feelingdistressed or U of T Engineering's Urgent Support – Talk to Someone Right Now.

Accommodations

The University of Toronto supports accommodations for students with diverse learning needs, which may be associated with mental health conditions, learning disabilities, autism spectrum, ADHD, mobility impairments, functional/fine motor impairments, concussion or head injury, visual impairments, chronic health conditions, addictions, D/deaf, deafened or hard of hearing, communication disorders and/or temporary disabilities, such as fractures and severe sprains, or recovery from an operation.

If you have a learning need requiring an accommodation the University of Toronto recommends that students register with Accessibility Services as soon as possible.

We know that many students may be hesitant to reach out to Accessibility Services for accommodations. The process of accommodation is private; we will not share details of your needs or condition with any instructor.

If you feel hesitant to register with us, we encourage you to reach out for further information and resources on how we can support. It may feel difficult to ask for help, but it can make all the difference during your time here.

Phone: 416-978-8060
Email: accessibility.services@utoronto.ca

Plagiarism Detection Tool

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (https://uoft.me/pdt-faq).

Academic Integrity

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarismâ€”representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or programâ€”is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. To learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website. Consult the Code of Behaviour on Academic

Matters for a complete outline of the University's policy and expectations. For more information, please see the U of T Academic Integrity website.

Academic Integrity and Generative AI

The ability to communicate engineering knowledge effectively across a range of contexts and audiences is a key learning objective in this course. Your submitted assignments must demonstrate this learning objective, and as such, should be **your own original and independent work.** Because of this, students must be cautious when using generative AI (GenAI) tools (such as but not limited to ChatGPT) in their assignments. GenAI tools may not be used to create text that is represented as your own independent work in assignments. However, GenAI may serve as a tool for parts of the writing process, such as brainstorming, outlining, and research, **if acknowledged appropriately.**

Since there are currently no firmly established standards for acknowledging or referencing GenAI use, a**ny substantive effort** to acknowledge the use of GenAI will be accepted. However, failure to acknowledge the use of GenAI tools (when they have been used) will be considered an academic offence. To acknowledge your use of GenAI, you should provide (1) a citation in the text and (2) a reference in your works cited using the following format: Tool Name, URL, Date used, Description how it was used, "Prompt(s) used." Because similar prompts will generate different responses at different times, if you use GenAI as a source, you must include a screenshot of the output in an appropriately titled appendix. If you are using the output of the GenAI tool directly in your text, you must treat it like any other source, meaning you must place the text in quotation marks followed by an embedded citation*. Given the fluid nature of GenAI use in university pedagogy, we encourage student engagement on the topic; if you have any additional questions about the use of GenAI in your assignments, please contact your instructor(s).

**Note: GenAI tools do not carry any inherent authority. Using source material (directly or indirectly) from a GenAI tool will not help you to meet one of the central objectives of engineering research and source usage, which is to provide authority or to support claims you make.*

Equity, Diversity and Inclusion

Looking for community? Feeling isolated? Not being understood or heard?

You are not alone. You can talk to anyone in the Faculty that you feel comfortable approaching, anytime – professors, instructors, teaching assistants, first-year or upper years academic advisors, student leaders or the Assistant Dean of Diversity, Inclusion and Professionalism.

You belong here. In this class, the participation and perspectives of everyone is invited and encouraged. The broad range of identities and the intersections of those identities are valued and create an inclusive team environment that will help you achieve academic success. You can read the evidence for this approach here.

You have rights. The University Code of Student Conduct and the Ontario Human Rights Code

protect you against all forms of harassment or discrimination, including but not limited to acts of racism, sexism, Islamophobia, antisemitism, homophobia, transphobia, ableism, classism and ageism. Engineering denounces unprofessionalism or intolerance in language, actions or interactions, in person or online, on- or off-campus. Engineering takes these concerns extremely seriously and you can confidentially disclose directly to the Assistant Dean for help here.

Resource List:

- Engineering Equity, Diversity & Inclusion Groups, Initiatives & Student Resources
- Engineering Positive Space Resources
- Request a religious-based accommodation here
- Email Marisa Sterling, P.Eng, the Assistant Dean, Diversity, Inclusion & Professionalism here
- Make a confidential disclosure of harassment, discrimination or unprofessionalism here or email engineering@utoronto.ca or call 416.946.3986
- Email the Engineering Society Equity & Inclusivity Director here
- U of T Equity Offices & First Nations House Resources

Additional Content

Tutorials

The tutorials comprise the following activities, one or more of which may take place during your tutorial slots. **Attendance of tutorials with structured activities is mandatory.** For the latest tutorial times / locations, please refer to Quercus.

- Structured tutorials (STs) on various topics, including usage of CAD tools such as Multisim and Altium Designer, which take place in BA3128;
- Mandatory one-on-one meetings with communication instructors (CIs), which take place in the tutorial rooms or online (not BA3128);
- Computer-aided design of your project with TA support, which take place in BA3128.

Labs

The labs comprise the following activities, one or more of which may take place during your practical slots. **Attendance of practicals with structured activities is mandatory.** For the latest practical times / locations, please refer to Quercus.

- Structured labs (SLs) on various topics, including soldering, instrument usage, test automation, etc. These take place in MY435;
- In certain weeks, computer-aided design of your project with TA support, which take place in BA3128;
- Unstructured lab time in MY435, to build and test your project, with TA support (MY435);
- Mandatory one-on-one meetings with TAs, which take place wherever the labs take place that week or online.

CAD / Computer Tools

- Altium Designer
- LTspice
- Git
- Microchip MPLAB IDE
- PyVISA (virtual instrument software architecture library for Python)