Electronics Syllabus

Department of Physics and Atmospheric Science

PHYC3340 Fall 2025

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor and Teaching Assistant

Name	Email	Office Hours*
Daniel Labrie	Daniel.Labrie@dal.ca	"open", Dunn room 232
Claire Floras (TA)	Claire.Floras@dal.ca	Dunn room 242

***Office hours*:**
In person: Normally, any time to answer questions related to the class materials or assignments on week days afternoons.
Team's meeting: An invitation will be sent to the student for a meeting at a mutually agreed time.
E-mail: It will be used only to provide one-line answer to questions. I will respond within 24 hours.

Course Description

This course introduces students to electronics and measuring techniques. Topics include digital electronics: logic gates, clocks, shift registers, counters, memory; analog electronics; R.C.L. circuits, operational amplifiers; electronic systems: A/D and D/A chips, computer chips, and displays.

Course Prerequisites

PHYC 2150.03 and PHYC 2515.03, or permission of the instructor.

Course Exclusions

Credit cannot be obtained for both PHYC 3340A and PHYC 3000A

Student Resources and Materials

- *Suggested textbook:*
  "Introductory electronics for scientists and engineers", 2nd Edition, by R. E. Simpson, Allyn and Bacon, Inc. 1987, ISBN 0-205-08377-3. It is out of print. There is a copy in the lab room 107 and a copy in the Physics office for approximately 2 h loan in exchange for your Dal card. The class notes are very detailed, complete with some examples. Additional examples can be found online.

- *Brightspace course page: PHYC 3340 – Electronics (Sec 1) – 2025 Fall*

Course Structure

Course Delivery
In-person. The Electronics lectures have been recorded and available on the course Brightspace. If you miss a lecture, you can watch it online and ask me any questions at a later date.

Lectures
MWF 11:35 – 12:25, Dunn room 101.

Electronic Laboratories
Thursdays 14:35 – 17:25 starting on Oct 9th, 2025.
8 laboratories, 3 hours each to be held in Dunn room 107.

Assessment

Marking scheme A

Component	**Weight**	**Date**
• Electronic Laboratories (8):	16 %	Thursdays from 14:35 – 17:25
• Assignments (best 5 out of 7):	30 %	weekly due on Fridays at 11:35
• *Two tests 15 % each:	30 %	to be held on Fri Oct 31st and Wed Dec 10th from 11:35 – 12:25
• Final examination:	24 %	TBD by the registrar

TOTAL: **100 %**

*See attached for the list of topics covered during each test.

Marking scheme B:

Component	**Weight**	**Date**
• Electronic Laboratories (8):	16 %	Thursdays from 14:35 – 17:25
• Assignments (best 5 out of 7):	30 %	weekly due on Fridays at 11:35
• Highest grade of the two tests:	20 %	to be held on Fri Oct 31st and Wed Dec 10th from 11:35 – 12:25
• Final examination:	34 %	TBD by the registrar

The final grade will be calculated using both schemes and the highest final grade will be selected for the course.

Conversion of numerical grades to final letter grades follows the Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

- Late assignment (11:36 onward) will receive a mark deduction of 10 %/24 hour and after 48 hours a mark of zero.
- To simplify the accountability regarding the days of illness a student may have during the term and the maximum of 2 *Student Declaration of Absence forms* that can be submitted during the term, then only 7 – 2 assignments will be used toward the calculation of the total assignment for the term.
- Collaboration on assignments: It is expected that students discuss together assignments problems on how to solve problems! However, your submitted assignment represents your own work.
- If a test cannot be done at the schedule time and the *Student Declaration of Absence form* is submitted, then the test will be rescheduled at a mutually agreed time. Otherwise, a grade of zero will be attributed to the test.
- A missed (or fraction thereof) Electronics lab will receive a mark deduction of 2 % toward the final grade.

Assignment Format:

In order to facilitate marking of the assignments, please follow these guidelines:

1) Use 8 1/2" x 11" paper.

2) Write clearly. Can the lecturer read the solution?

3) Start each question on a new sheet of paper.

4) Clearly indicate the question number at the top right-hand corner of the page.

5) Use the same numbering as in the assignment sheet.

6) Whenever applicable, give the answer to three significant digits in either fixed or scientific notation.

7) Show the full solution to the problem; not only the answer. The lecturer wants to see that you understand the problem.

8) Submit your assignment with a cover sheet clearly showing your banner number and assignment number. You may want to use the assignment sheet as the cover sheet

9) Arrange your answers to the questions in the same order given in the questionnaire. Otherwise, the solutions will not be marked.

10) Submit a ***paper copy*** where all the solutions are oriented in the ***up position***. Otherwise, the solution(s) will not be marked. An electronic submission will not be accepted unless it is late.

11) Please ***verify*** your paper copy before submission to make sure that it follows the above guidelines.

Your assignment mark is final unless the above guidelines are followed.

Course Policies related to Academic Integrity

It is an academic offense to copy someone else solution. It is very easy to tell if copying occurred. Allegation of copying will be submitted to an Academic Integrity Officer of the Faculty of Science for evaluation and possible sanction. Minimum sanction: Zero on the assignment (2.86 % toward the final grade) which must be included in the calculation of the final grade and 5 % grade penalty toward the final grade. When caught, cheating is costly.

Course Learning Objectives

1) To understand basic concepts in analog and digital electronics.

2) To know how to use a digital multimeter, an oscilloscope with probes, function generator, a protoboard, and their limitations.

3) To design and build simple electronic circuits on a protoboard.

4) To test and trouble shoot the circuits using equipment listed in 2)

Course Content

Time permitting the Learning Topics are:

(List of modules on Electronics, videos, and class notes within Brightspace)

Module 1: Direct Current (DC) Circuits

Videos: 1.1 Ohm's and Kirchhoff's Laws, and Circuit Analysis
1.2 Voltage Divider and Thevenin's Theorem
1.3 Circuit Loading and Input and Output Resistance
1.4 Instruments

Module 2: Charging and discharging of a capacitor

Video: 2 Charging and Discharging of a Capacitor

Module 3: Alternative Current (AC) Circuits

Videos: 3.1 Introduction to AC Circuits
3.2 Circuits and the Bode Plot
3.3 LRC Resonant Circuits
3.4 Measurement of |A| and Phase Angle
3.5 The Scope Probe - Another Form of an RC Circuit
3.6 Transformers

Module 4: Diodes and their Applications

Video: 4 Diodes and Their Applications

Module 5: Operational Amplifiers

Videos:
5.1 Introduction to Op-Amps and Circuit Analysis
5.2 Non-Inverting Op-Amp and Difference Op-Amp
5.3 Current Op-Amp and "Math" Op-Amps
5.4 Op-amp Comparator and the Schmitt Trigger
5.5 Low Pass, High Pass, and Band Pass Filters Revisited
5.6 Second Order Low Pass Op-Amp Filter
5.7 Second Order Sallen Key Low Pass and High Pass Filters
5.8 Chebyshev, Butterworth, and Bessel Filters
~~5.9 Op-Amp Imperfections - Input Bias Current and Input Offset Voltage~~
~~5.10 Op-Amp Imperfections: The Op-Amp Frequency Response and the Common Mode Gain~~

~~**Module 6: Oscillators and Monostables**~~

~~Video: 6. Oscillators and Monostables~~

Module 7: Combinational Logic

Videos:
7.1 Boolean Algebra and Gates
7.2 Application of Digital Gates
7.3 Design of a Digital Network and Circuit
7.4 The Digital Die
7.5 The Karnaugh Map
7.6 The Seven Segments Display

Module 8: Sequential Logic

Videos:
8.1 Basic Unit of Memory - The RS Flip Flop (FF) and Its Variations
8.2 Edge-Triggered FFs
8.3 Ripple Counters
8.4 Synchronous Counter
8.5 Counters and Other Digital Circuits

Module 9: ADC – DAC Conversion

Videos:
9.1 ADC and the Sampling Theorem
9.2 DAC and Analog Circuits
9.3 ADC Circuits, and Sample and Hold Circuits
9.4 Commercial ADCs and NI Data Acquisition Cards

Approximate schedule: Half the term will be dedicated to Analog Electronics while the remaining half of the term will be on Digital Electronics.

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about-dal/internationalization.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html)

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: http://www.dal.ca/cultureofrespect.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: https://www.dal.ca/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.html

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.

Faculty of Science

Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates): http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol: https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html

Dalhousie Grading Practices Policies: https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy: https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html

General Academic Support – Advising (Truro): https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Indigenous Connection: https://www.dal.ca/about-dal/indigenous-connection.html

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803: https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf

Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre.html

LGBTQ2SIA+ Collaborative: https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html

Dalhousie Libraries: http://libraries.dal.ca/

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Dalhousie Student Advocacy Services: https://www.dsu.ca/dsas?rq=student%20advocacy

Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Human Rights and Equity Services: https://www.dal.ca/dept/hres.html

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Faculty of Science Advising Support: https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html

Safety

Biosafety: http://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: http://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Laser Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html