

PHYS 2305 for Winter 2026

Electricity and Magnetism

We, the people of the Faculty of Science at Carleton University, acknowledge that our campus is located on the traditional, unceded territories of the Algonquin Anishinabeg people. Miigwetch for your hospitality and stewardship of this territory and the teachings that come from it. We are grateful for this land, the air that we breathe, and the water that sustains us all as well as for the animals, plants and other living beings: these enable us to research, teach, mentor, support, study, and learn. We recognize our responsibility to our natural environment and to reconciliation with Indigenous peoples.

Course Instructor: Tong Xu

How to address me: Dr. Tong

Gender Pronouns: (he/him/his)

Email: txu@physics.carleton.ca

Note: If you have a question or would like to talk with me, you can send an email, visit me during student hours (see below), or approach me after lecture.

Student Hours: Tuesdays 2pm- 3pm, HP 3318

Office Location: Room 3318,
Herzberg Laboratories Building

Class Location: Please check Carleton Central

Class Times: Tuesdays & Thursdays, 11:35am-12:55pm

Prerequisites: PHYS 1001, PHYS 1002 or PHYS 1003 and PHYS 1004, alternatively PHYS 1007 and PHYS 1008 with an overall grade of B- or higher; MATH 2004 or MATH 2000 (MATH 2000 may be taken concurrently).

Department/Unit: Physics

Topics Covered and Learning Outcomes

Topics to be Covered

Week	Topic/Content	Textbook sections
1	Coulomb's law, vector algebra, Electric field	1.1 and 2.1
2	Continuous charge distributions, curvilinear coordinates, differential calculus	1.2, 1.4 and 2.1
3	Integral calculus, Gauss' law	1.3 and 2.2
4	Application of Gauss' law, Electric Potential	2.2 and 2.3
5	Midterm #1	
6	Work and energy, conductors	2.4 and 2.5
7	Winter reading break – no classes	
8	Magnetic force, currents, Biot-Savart law	5.1 and 5.2
9	Ampere's law	5.3
10	Electromotive force, electromagnetic induction, Faraday's law	7.1 and 7.2
11	Midterm #2	
12	Inductance and energy in magnetic fields, Ampere-Maxwell law, conservation of charge	7.2, 7.3 and 8.1
13	Conservation of energy, EM waves in vacuum	8.1 and 9.1
14	EM waves in vacuum, final review	9.2

Important dates and deadlines can be found here:

<https://carleton.ca/registrar/registration/dates/academic-dates/>, including class suspension for fall, winter breaks, and statutory holidays.

Course level learning outcomes:

1. Describe and explain the fundamental principles of electromagnetism including electrostatics, magnetism, induction, Maxwell's equations and electromagnetic waves.
2. Use an understanding of calculus along with physical principles to effectively solve physical problems in electricity and magnetism.

Assessments

Grade Breakdown

COMPONENT	GRADE VALUE
ASSIGNMENTS (G)	35 %
MIDTERM TESTS (2)	30 %
FINAL EXAM	35 %

Assignments will be distributed roughly each week throughout the term and will generally be due one week after distribution.

The assignments are a critical part of the course and working through the problems yourself is essential to learn the material. Your homework solutions should be thorough, self-contained, and logical, with all steps explained. Students are permitted to discuss concepts and strategies related to solving the homework assignments, however, the work you turn in must be your own. Copying any part of the solution from an online resource like Chegg or AI is considered an academic offence.

Assignments will be posted and submitted on Brightspace. Hand-written solutions may be scanned or photographed for upload. The complete assignment must be uploaded as a single PDF file.

The lowest 2 assignment grades will be dropped.

There will be two 80-minute (in-person) midterm tests held during class time, on February 5th and on March 19th.

Late and Missed Work Policies

Late Work

Late assignments will generally not be accepted except under exceptional conditions (family emergency, illness). If, due to one of the previously mentioned reasons, you will be unable to submit your assignment by the deadline you must contact the instructor no later than 24 hrs after the assignment submission deadline and complete the [academic considerations form](#).

Missed Work

There will not be any accommodations for missed assignments apart from the lowest two assignment grades will be dropped. In the case of a missed midterm exam you must submit an academic considerations form. The instructor will follow up to discuss accommodations for the missed exam.

Learning Material(s) and Other Course/Lab-Related Resources

Learning Material	Options for Purchasing	Approximate Cost
David J. Griffiths, "Introduction to Electrodynamics," 5th Edition (Cambridge University Press)	Available at Carleton U bookstore.	\$80 Or \$ 64 for e-book.

This course will be compatible with the 3rd and 4th editions of the textbook, students may use either. The same textbook will be used for PHYS 3308.

Academic Accommodations and Regulations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website (<https://students.carleton.ca/course-outline/>).

Statement on Chat GPT/Generative AI usage

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

AI Use in this course

Students may use AI tools to advance their knowledge and build skills. An example of a permissible use is the following:

- Interactive learning (e.g., AI driven assessment of student skill with follow up recommendation of customized learning plan in alignment with course level learning outcomes). Any AI-generated outputs should be critically evaluated for correctness and AI should enhance, not replace, the student's learning process.

Consider this prompt: "Hello, I am a student in [year] [class]. I would like to create a learning plan for myself related to the learning outcomes of [learning outcomes of course]. Assess my current knowledge of these outcomes through dialogue and then recommend where I can improve knowledge and how. [Student: enter any areas of difficulty specific to you here]. Create a draft learning plan mapping out activities I can do to meet these goals".

The use of AI tools for solving assignment questions is not permitted.

Statement on Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using artificial intelligence tools such as ChatGPT when your assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in [Carleton University's Academic Integrity Policy](#). A list of standard sanctions in the Faculty of Science can be found [here](#).

Additional details about this process can be found on [the Faculty of Science Academic Integrity website](#).

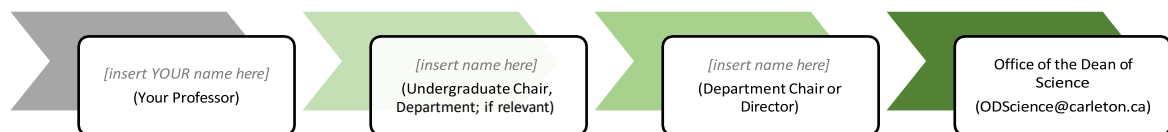
Students are expected to familiarize themselves with and abide by [Carleton University's Academic Integrity Policy](#).

Student Rights s Responsibilities

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the [7 Rights and Responsibilities Policy](#) for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Student Concerns

If a concern arises regarding this course, **your first point of contact is me**: Email or drop in during student hours and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):



Note: You can also bring your concerns to [Ombuds services](#).