

Carleton University Physics Department

PHYS 2305 – Electricity and Magnetism

Winter 2022

Course Outline

1. Course calendar description and pre-requisites

Electrostatic field and potential, Gauss' law. Properties of conductors. Magnetic effects from currents. Motion of charges in electric and magnetic fields. Energy in electric and magnetic fields. Electromagnetic induction. Maxwell's equations in vacuum using vector differential and integral calculus.

Prerequisite(s): 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).

2. Instructor contact information

Instructor: Dr. Emily Heath (she/her) – please address me as Dr/Prof Heath

Email: emily.heath@carleton.ca

Office hours: Wednesdays & Fridays 1:00pm – 2:00pm (via Zoom link on Brightspace)

Teaching assistant: Shivam Garg

Email: shivamgarg@cmail.carleton.ca

Office hours: by appointment (for questions about assignment marking)

In accordance with university policy, all communication with instructors and TAs must be via your Carleton email account.

3. Algonquin territory acknowledgement:

We acknowledge that the land on which we gather and learn is the traditional and unceded territory of the Algonquin nation. You are invited to learn more, reflect on how you can support anti-racism and decolonization, and take action. <https://carleton.ca/indigenous/>

4. Course textbook

David J. Griffiths, "Introduction to Electrodynamics," 4th Edition (Cambridge University Press, 2017).

This course will be compatible with the 3rd Edition, students may use either. PHYS 3308 will use the same textbook.

5. Course website

The course outline and other course information will be posted on the Brightspace website (www.brightspace.carleton.ca). We reserve the right to amend the course outline on the Brightspace website and will inform you if that version changes. In the event of any discrepancy between this document, and the version currently posted on the website, then the website version on Brightspace will be taken as the definitive version.

If you are unable to access Brightspace or need help with your computing account, please contact the ITS Service Desk at 613-520-3700 or email its.service.desk@carleton.ca

6. Course modality

This is a Hyflex course where students can choose to attend each scheduled lecture in person or online via Zoom. If you plan to attend online, then you will require reliable high-speed Internet access and a computer with a webcam and a headset with a microphone. There may also be certain classes that will be only online: e.g., if I cannot access campus as well as for midterm exams.

7. Lectures

Wednesdays and Fridays 16:05 – 17:25 (Eastern Time) in Tory Building room TB 340 or online via the Zoom link on the course Brightspace page. All lectures will be taught online from January 10-31.

The lectures in this course will be recorded and made available only to those within the class. Please note that recordings are protected by copyright. The recordings are for your own educational use, but you are not permitted to publish to third party sites, such as social media sites and course materials sites.

8. Course grading scheme

7.1 Homework assignments (40%)

Assignments will be given weekly and posted on Brightspace, with the due date and time noted there. Please scan and submit your solutions via Brightspace in a single pdf file.

Late assignments will not be accepted except for legitimate reasons such as illness. It is your responsibility to notify the instructor if you will be unable to hand in the assignment by the deadline.

Working through problems is an essential part of developing a deep understanding of the course material. Students are permitted to discuss concept and strategies related to solving the homework assignments; however, the work handed in must be their own. Copying any part of the solution from an online resource like Chegg is considered an academic offence.

7.2 Midterm exams (25%)

There will be two online midterm exams which will be held during the scheduled lecture times on February 9th and March 16th. You may use your notes and textbook during the exam, but no other assistance is allowed (eg. accessing the internet is not permitted). After each midterm exam there will be a mandatory follow-up oral exam.

Please note that tests and examinations in this course will use a remote proctoring service provided by Scheduling and Examination Services. You can find more information at <https://carleton.ca/ses/e-proctoring/>.

7.3 Final exam (35%)

An online final exam will be held during the final exam period from April 14th-28th. The exam will be 3 hours in duration. More information about the final exam will be provided closer to the final exam date. A mandatory follow-up oral exam will be scheduled after the exam.

9. Lecture topics and dates

Topic Description	Textbook Sections	Approximate Date(s)
Course intro, vector algebra, Coulomb's law, the Electric field	1.1 and 2.1	January 12 th
Continuous charge distributions	2.1	January 14 th
Differential and integral calculus	1.2 and 1.3	January 19 th
Gauss' law	2.2	January 21 st
Electric potential	2.3	January 26 th
Poisson's equation	2.3	January 28 th
Work and energy	2.4	February 2 nd
Conductors	2.5	February 4 th
Midterm exam #1		February 9 th
Lorentz force law	5.1	February 11 th
Biot-Savart law	5.2	February 16 th and 18 th
Winter Reading Week – no classes		February 21 st – 25 th
Ampere's law	5.3	March 2 nd
Electromotive force	7.1	March 4 th
Electromagnetic induction	7.2	March 9 th and 11 th
Midterm exam #2		March 16 th
Maxwell's equations	7.3	March 18 th
Conservation of charge and energy	8.1	March 23 rd
Conservation of momentum	8.2	March 25 th
Waves in one dimension	9.1	March 30 th
Electromagnetic waves in vacuum	9.2	April 1 st and 6 th
Review/catch-up		April 8 th

10. University Policies

Grade Definition:

In accordance with the Carleton University Undergraduate Calendar Regulations, the letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100 B+ = 77-79 C+ = 67-69 D+ = 57-59

A = 85-89 B = 73-76 C = 63-66 D = 53-56

A- = 80-84 B- = 70-72 C- = 60-62 D- = 50-52

F = <50

WDN = Withdrawn from the course

ABS = Student absent from final exam

DEF = Deferred (See above)

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean.

Academic Regulations, Accommodations, Plagiarism, Etc.:

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:

<http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/>

Academic Integrity

Submitting an examination or an assignment that is copied, in whole or in part, from someone else is considered plagiarism, which is an academic misconduct offence. This includes copying the full solution or any part of the solution from an online resource like Chegg, or from any other type of unauthorized source.

Plagiarism is a serious offence that cannot be resolved directly by the course's instructor. The Associate Dean of the Faculty conducts a rigorous investigation, including an interview with the student, when an instructor suspects a piece of work has been plagiarized. Penalties are not trivial. They can include a final grade of "F" for the course.

<https://carleton.ca/registrar/academic-integrity/>

Course Copyright

Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copyright protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s).

Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

Academic Accommodations

Text from <https://students.carleton.ca/course-outline/>

Carleton University is committed to providing access to the educational experience in order to promote academic accessibility for all individuals.

Academic accommodation refers to educational practices, systems and support mechanisms designed to accommodate diversity and difference. The purpose of accommodation is to enable students to perform the essential requirements of their academic programs. At no time does academic accommodation undermine or compromise the learning objectives that are established by the academic authorities of the University.

Pregnancy Obligation:

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website

<https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Religious Obligation:

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website

<https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>

Academic Accommodations for Students with Disabilities:

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation

arrangements are made. For more details, visit the Paul Menton Centre website

<https://carleton.ca/pmc>

Survivors of Sexual Violence:

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit:

<https://carleton.ca/sexual-violence-support>

Accommodation for Student Activities:

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, see the policy at

<https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

Assistance for Students:

Career Services: <https://carleton.ca/career/>

Academic Advising: <https://carleton.ca/academicadvising/>

Co-operative Education: <https://carleton.ca/co-op/>

Centre for Student Academic Support: <https://carleton.ca/csas/>

Writing Services: <https://www.carleton.ca/csas/writing-services/>

Peer Assisted Study Sessions (PASS): <https://carleton.ca/csas/group-support/pass/>

Math Tutorial Centre: <https://carleton.ca/math/math-tutorial-centre/>

Science Student Success Centre: <https://sssc.carleton.ca/>

Freedom of Information and Protection of Privacy:

Carleton University is committed to protecting the privacy of those who study or work here (currently and formerly). To that end, Carleton's Privacy Office seeks to encourage

the implementation of the privacy provisions of Ontario's *Freedom of Information and Protection of Privacy Act* (FIPPA) within the university.

In accordance with FIPPA, please ensure all email communication with staff/faculty is via your Carleton email account. To get your Carleton email you will need to activate your MyCarletonOne account through Carleton Central. Once you have activated your MyCarletonOne account, log into the MyCarleton Portal.

Important Dates:

<https://calendar.carleton.ca/academicyear/>

<https://carleton.ca/registrar/registration/dates-and-deadlines/>

Information for COVID-19 measures:

All members of the Carleton community are required to follow COVID-19 prevention measures and all mandatory public health requirements (e.g. wearing a mask, physical distancing, hand hygiene, respiratory and cough etiquette) and [mandatory self-screening](#) prior to coming to campus daily.

If you feel ill or exhibit COVID-19 symptoms while on campus or in class, please leave campus immediately, self-isolate, and complete the mandatory [symptom reporting tool](#). For purposes of contact tracing, attendance will be taken in all classes and labs. Participants can check in using posted QR codes through the cuScreen platform where provided. Students who do not have a smartphone will be required to complete a paper process as indicated on the [COVID-19 website](#).

All members of the Carleton community are required to follow guidelines regarding safe movement and seating on campus (e.g. directional arrows, designated entrances and exits, designated seats that maintain physical distancing). In order to avoid congestion, allow all previous occupants to fully vacate a classroom before entering. No food or drinks are permitted in any classrooms or labs.

For the most recent information about Carleton's COVID-19 response and required measures, please see the [University's COVID-19 webpage](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca

Please note that failure to comply with University policies and mandatory public health requirements, and endangering the safety of others are considered misconduct under

the [Student Rights and Responsibilities Policy](#). Failure to comply with Carleton's COVID-19 procedures may lead to supplementary action involving Campus Safety and/or Student Affairs.