

PHYS 1004A: Course Outline

Fall 2026

Introductory Electromagnetism and Wave Motion

Section A

Instructor: Hassan Easa (he/him)

Email: hassaneasa@cunet.carleton.ca

Office Hours: TBD

Lecture Format: In-Person

Class Times: Mondays & Wednesdays,
10:05 am - 11:25 am

Class Location: Please check your
Carleton Central for the class location

Primary Text: Halliday, Resnick &
Walker (Fundamentals of Physics 12th
edition)

Website: <https://carleton.ca/brightspace/>

Course Dates: September 09, 2026 –
December 11, 2026

Lab & Tutorial Supervisor: Ms. Tamara
Rozina

Email: tamara.rozina@carleton.ca

Lab Location: HP 4130

Lab Shedule: Tuesdays, 1:05 pm - 3:55 pm

First Lab: September 15, 2026

Lab Supervisor Office Hours: 10 am -11
am HP 3374

1 Course Description & Learning Model

Engineering and physics programs require a deep understanding of foundational science, and this calculus-based course introduces electricity and magnetism with an emphasis on mastering the concepts necessary for success in your studies. The curriculum provides a thorough examination of electric and magnetic fields alongside their associated forces, electric potential, and potential energy. Students will explore the principles of magnets, electromagnetic induction, alternating current, electric circuits, and electromagnetic waves, all of which form the basis for modern technological applications.

The accompanying laboratory and tutorial sessions alternate each week and serve as an essential practical complement to the classroom lectures. These sessions allow you to engage in hands-on experimentation and collaborative problem-solving to deepen your understanding of the material. Student evaluations are structured around laboratory performance, weekly tutorial tests, active classroom participation, and a comprehensive final exam. To ensure academic success, you must earn a satisfactory grade in the laboratory component to pass the course.

2 Course Objectives and Keys to Success

Physics offers a great opportunity to master quantitative thinking, helping you transform abstract concepts into real-world calculations and measurements. To solve problems effectively, you must learn to critically evaluate data, choose the right methods, and analyze your answers. Developing this critical problem-solving ability is a central goal of the course and will benefit you throughout your future career.

However, physics is a subject that demands active engagement. Simply reading a problem, looking over its solution, or memorizing a concept is not enough to succeed in this course. To truly deepen your understanding and pass, **you must actively practice** by working through many different examples on your own. Consistently attending every lecture and keeping up with the assigned readings are also absolutely vital to building a strong foundation. Success requires you to dedicate significant time to studying outside of class, interacting with the material, and applying these principles yourself.

3 Land Acknowledgement

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.

4 Course Prerequisites

Successful completion of MATH 1004 is a **strict** requirement for registration in this course. In addition, students **must meet one of** the following prerequisite paths:

- Completed ECOR 1033 and ECOR 1034 (these two ECOR courses may be taken concurrently)
- Completed PHYS 1001 or PHYS 1003
- Completed PHYS 1007 with a minimum grade of *B*–

Some of these prerequisites may be waived with the explicit permission of the physics department.

5 Student Hours

Please feel free to email me to schedule an in-person or Zoom appointment if you need assistance with the course material. I am also available before and after our regular lectures. You can **simply approach me** before/after class if you have any questions about the course content.

6 Course Delivery

This course is designed for in-person delivery and is not suitable for an online format. Lectures take place on Mondays & Wednesdays, 10:05 am - 11:25 am, where I teach **primarily using** the blackboard alongside presentation slides. Please ensure you bring your preferred writing tools to

class to take notes. While I will post our presentation slides on the course webpage, these files are brief outlines and do not contain the comprehensive details covered during live lecture sessions. For this reason, **attendance** is strongly recommended to succeed in this course, even though it is not mandatory.

Course Copyright: Please note that all classroom teaching and learning activities, including lectures, discussions, and presentations, are protected by copyright. These activities, along with all course materials such as presentation slides and outlines, remain the intellectual property of their respective authors. As a registered student, you are welcome to take notes and make copies of these materials strictly for your own personal educational use. However, you are **not permitted** to reproduce, share, or distribute lecture notes or course materials publicly for either commercial or non-commercial purposes without express written consent from the copyright holders. This includes a strict prohibition against publishing materials on third-party platforms, such as social media or course study websites.

7 Required Textbook

Fundamentals of Physics, 12th edition by Halliday, Resnick and Walker, John Wiley & Sons Canada Ltd, is the **primary textbook** for this course. This book can be purchased at the Carleton University [Bookstore](#). The course textbook can be **purchased** (print for \$153.95) or rented (digital for \$57.00) at Carleton's campus bookstore. The textbook is available from various external retailers, including the publisher or Amazon. For more affordable pricing, looking for used copies of the book is often recommended.

Any edition of the textbook is acceptable, whether it is new or used (9th, 10th, 11th, 12th). Please note, however, that the recommended section numbers in older versions may not match the specific sections posted on our course website. There are **no other ancillary fees** associated with this course (e.g., course packs, lab manuals, etc.).

Supplementary material: There are many other excellent textbooks covering some of the materials in this course, such as:

- University Physics with Modern Physics by Hugh D. Young and Roger A. Freedman, published by Pearson.
- Physics by Alan Giambattista, Betty McCarthy Richardson, and Robert C. Richardson, published by McGraw-Hill.

8 Grade Distributions

Student performance in this course will be evaluated based on weekly online quizzes, labs, tutorial tests, and a final exam. Please note that there is **no midterm** examination for this course.

Academic Consultation

If you are not satisfied with your performance in this course, it is crucial that you discuss your concerns with your instructors early on. Please reach out during student hours or via email. Waiting until the end of the course to seek consultation limits our ability to help you improve.

The final grade distribution breakdown is as follows:

Assessment Component	Delivery Method	Weight
Weekly Online Quizzes	Administered via Brightspace (Best 8 of 10 count)	15%
Tutorial Tests	In-person problem analysis (Best 4 of 5 count)	25%
Laboratory Work	All 5 experiments count toward final grade	35%
Final Examination	Formally scheduled, in-person	25%

Mandatory Performance Barriers

1. **Laboratory Threshold:** Students must obtain 50% **or higher** on the laboratory component to pass the course. Failure to score the 50% lab mark results in an automatic course grade of **F**, irrespective of exam grades.
2. Attending all labs and tutorials is **mandatory**. Additionally, to pass this course, students must obtain **at least** 50% on the theory component, which includes weekly quizzes, tutorials, and the final exam.
3. **Final Exam Requirement:** A student must complete the formally scheduled final exam paper to pass the course.

9 Final Exam & Weekly Online Quizzes

There is no mid-term examination in this course. The **final exam** will be 3 hours long, given during the Carleton final examination period in December 2026. The exact format of the final exam will be discussed further well in advance during the regular class schedule. Students are responsible for being present during the entire final exam period. Travel and holiday arrangements must not be scheduled until the final exam date is officially announced. The final examination is **mandatory**, and it may include questions covering materials from the laboratory portion of the course.

The final exam will be a closed-book exam, and a formula sheet will be provided. A sample of the formula sheet is available on Brightspace. Accommodations for **missed** final exams must be arranged through the registrar's office.

9.1 Brightspace Weekly Quizzes

Each week, you will find a new quiz available on Brightspace. These are always **due on Friday nights** by midnight. To help you succeed, you get **two attempts** for each quiz with a generous two-hour time limit per attempt. Please note that questions are randomly pulled from a question bank, so your next attempt will feature a different set of questions. Only your highest score will be used for your grade! We will have a total of 10 quizzes; however, I will only count your **best 8 scores**.

If there is **any discrepancy** between the marks posted on Brightspace and your calculated values, notify the instructor immediately.

9.2 Formatting Calculation Answers (Weekly Quizzes)

When an assignment question requires a calculation, please enter your response in **scientific notation** using three significant figures (e.g., 1.60×10^{-19}). To account for rounding discrepancies, a 5% deviation from the exact Brightspace calculation is permitted. However, if a question explicitly

requests a different number of significant figures or a specific precision level, you must follow those instructions exactly. Answers that fall outside these stated accuracy or significance ranges will be marked as incorrect. Always pay close attention to the requested units. Answers are typically expected to use standard SI units (e.g., m, s, J). When non-standard units are required, it will be explicitly stated in the prompt (e.g., “Express your answer in km”). **Do not enter** the unit symbols alongside your numerical answer.

10 Lecture Schedule & Reading Assignments

This course consists of 22 in-person lectures, with each session running for approximately 80 minutes. Below you will find the weekly schedule of topics along with corresponding textbook sections and recommended textbook readings. Students are **expected to** complete the assigned textbook readings before each lecture and complete assigned homework problems.

11 Laboratory & Tutorial Sessions

11.1 Tutorials

All laboratories and tutorials will be held exclusively in person, as no online alternatives are offered for these sessions. The schedule begins the week of September 14, with tutorials and laboratory sessions alternating every other week. To assist you during these sessions, a formula sheet will be provided that is identical to the version posted on Brightspace. To prepare for each tutorial, a set of practice problems will be posted online in advance. You should attempt to solve these questions beforehand to ensure you are ready for the session. Each tutorial begins with the instructor solving a problem on the board, followed by teaching assistants demonstrating solutions to the practice set and answering any remaining questions. The **final hour** of the session consists of a **one-hour**, closed-book test featuring two multiple-choice problems and one long-answer problem. Your final tutorial grade will be determined by your **four highest test scores** out of five. Please note that **there will be no** make-up tutorial tests and there will be **no deferred** tutorial tests.

11.2 Labs

The introduction session will take place on September 15, 2026, and the first lab will take place on September 22, 2026.

All the experiments and tutorials will be held in person in room HP 4130.

Information regarding each experiment can be found on the course Brightspace page. Please refer to the table below for the official lab and tutorial schedule.

It is imperative that all students attend the first lab. If you missed a laboratory session, you must contact the Lab Supervisor, Ms. Tamara Rozina(tamara.rozina@carleton.ca) immediately. A make-up session may be arranged at the end of term in these cases. Make-up sessions are reserved for emergency situations only, and no more than one session per student is possible. Failure to reach out regarding a missed laboratory session will result in a grade of zero for the experiment in question.

All experiment write-ups must be handed in at the end of the lab session. **No late submissions will be accepted.**

Week	Topic(s)	Textbook Chapter(s)	Quiz Due
1 Sept 09	Vectors Review Electrostatics	Chapter 3: Vectors Chapter 21: Coulomb's Law	
2 Sept 14 & 16	Electrostatics Electric Fields (point charges) Electric field (continuous charge distributions)	Chapter 21: Coulomb's Law Chapter 22: Electric fields	Sept 18
3 Sept 21 & 23	Electric field (continuous charge distributions) Gauss's Law	Chapter 22: Electric fields Chapter 23: Gauss' Law	Sept 25
4 Sept 28 & 30	Work and energy Electric Potential	Chapter 7: Kinetic energy and work Chapter 8: Potential energy and conservation of energy Chapter 24: Electric potential energy	Oct 02
5 Oct 05 & 07	Potential Energy Potential of Charge Distributions E-V Relations	Chapter 24: Electric potential energy	Oct 09
6 Oct 14	Capacitance Capacitance and Dielectrics	Chapter 25: Capacitance	Oct 16
Oct 26 – Oct 30 Fall Reading Week No Lectures			
7 Nov 02 & 04	Capacitance and Dielectrics Magnetic fields	Chapter 25: Capacitance Chapter 28: Magnetic fields	Nov 06
8 Nov 09 & 11	Magnetic fields Magnetic fields due to currents	Chapter 28: Magnetic fields Chapter 29: Magnetic fields due to currents	Nov 13
9 Nov 16 & 18	Induction	Chapter 30: Induction and Inductance	Nov 20
10 Nov 23 & 25	AC circuits (RC and RLC)	Chapter 31: EM oscillations and alternating current	Nov 27
11 Nov 30 & Dec 02	Maxwell's equations Solutions of Maxwell's Equations	Chapter 32: Maxwell's equations	Dec 04
12 Dec 07 & 09	Electromagnetic waves Review	Chapter 33: Electromagnetic waves	
Dec 12 – Dec 23 Final Examinations Period			

All write-ups will be weighted equally and count towards the total lab grade for the course.

No lab grade will be dropped.

If you have **previously taken** this course and successfully completed all the laboratory work, you **may be eligible** for a lab exemption. These exemptions are never granted automatically, and

you **must formally apply** for consideration as soon as possible. The lab Supervisor reviews all requests on a case-by-case basis at their absolute discretion. To arrange an exemption at the start of the term, please contact the Lab Supervisor, Ms. Tamara Rozina, directly via email at tamara.rozina@carleton.ca.

Week	Date	Lab / Tutorial Session
1	September 15, 2026	Tutorial 0: Introduction
2	September 22, 2026	Lab 1: Electrostatics
3	September 29, 2026	Tutorial 1
4	October 06, 2026	Lab 2: Oscilloscope
5	October 13, 2026	Tutorial 2
6	October 20, 2026	Lab 3: Magnetic Balance
7	October 27, 2026	WINTER BREAK
8	November 3, 2026	Tutorial 3
9	November 10, 2026	Lab 4: RC & RLC Circuits
10	November 17, 2026	Tutorial 4
11	November 24, 2026	Lab 5: Ray Optics
12	December 01, 2026	Tutorial 5
13	December 08, 2026	MAKE-UP LABS

12 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 A = 85-89 A- = 80-84

B+ = 77-79 B = 73-76 B- = 70-72

C+ = 67-69 C = 63-66 C- = 60-62

D+ = 57-59 D = 53-56 D- = 50-52

F < 50

WDN = Withdrawn from the course

ABS = Student absent from final exam DEF = Deferred

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.

13 Inclusive teaching statement

Science is for everyone. I am committed to fostering an environment for learning that is inclusive for everyone. All students in the class, the instructor, and any guests should be treated with respect during all interactions. I would appreciate any feedback related to the class throughout the course.

The Faculty of Science EDI statement: <https://science.carleton.ca/about/edi/>

14 Academic Accommodations, Regulations, Plagiarism, Etc.

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. More information can be found [here](#). University rules regarding registration, withdrawal, appealing marks, and almost anything else you might need to know can be found on the university's website, [here](#).

15 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.

16 Addressing Human Rights Concerns

The University and all members of the University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at equity@carleton.ca

17 Religious Obligations

Please contact me 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, please review the [Student Guide to Academic Accommodation](#).

18 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/>

19 For Pregnancy

Please contact me 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, please review the [Student Guide to Academic Accommodation](#).

20 Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and to 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 me 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 [Senate Policy on Accommodation for Student Activities](#).

21 Academic Integrity

Academic misconduct undermines the values of honesty, trust, respect, fairness, and responsibility that we expect in this class. Carleton University provides support, such as academic integrity workshops, to ensure that all students understand and uphold these standards. Your teaching team also has a responsibility to apply the Academic Integrity Policy fairly and equitably.

Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy, which is strictly enforced and binding on all students. For more information, please see the [Carleton academic integrity page](#).

Academic Integrity Framework

The University Academic Integrity Policy defines plagiarism as passing off the ideas, phrasing, or work of another as one's own. In physics courses, this explicitly includes actions such as:

- Accessing unauthorized sites for assignments or tests
- Engaging in unauthorized collaboration on assignments and exams
- Copying raw numerical data or text descriptions from historical archives
- Modifying teammate data to submit individual reports
- Utilizing online solving engines or ChatGPT during evaluations

All suspected breaches are forwarded directly to the Office of the Dean of Science and bear severe academic penalties.

21.1 Generative Artificial Intelligence (AI) Usage Rules

For PHYS 1004, the utilization of Generative Artificial Intelligence tools is tightly bounded:

- ✓ **Permitted Assistance:** Checking basic text syntax, formatting layout attributes, or troubleshooting LaTeX code compilation strings.

- × **Strictly Forbidden Assistance:** Using AI tools to solve assignment problems, compute numerical values for laboratory data sheets, analyze experimental errors, or complete weekly Brightspace quizzes.

21.2 Penalties for Academic Misconduct

Faculty of Science penalties for violation of the Carleton policies on academic integrity are very serious and are structured as follows:

- **First offence:** A grade of zero on the work associated with the misconduct and a deduction of up to three grade points from the final course grade (for example, a final grade of B could be reduced to a C).
- **Subsequent offences:** Increasingly severe sanctions ranging from:
 - A final grade of F in the course
 - Suspension from studies for up to three semesters
 - Expulsion from the University

22 Assistance for Students

Here are some resources that might be useful:

- Carleton Physics **Drop-in Center:** <https://physics.carleton.ca/drop-in-centre>
- Academic and Career Development Services Writing Services: <https://carleton.ca/career/>
- 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/>

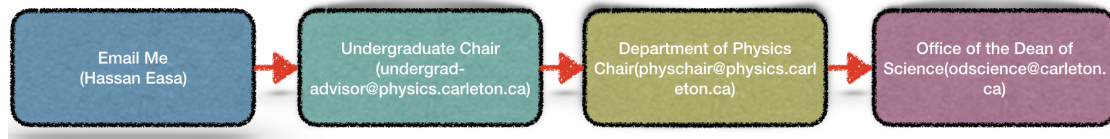
23 Additional Information

Students must always retain a hard copy of all work that is submitted.

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 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.

24 Student Concerns

If you have questions or concerns about this course, your **first step** should always be to reach out to me directly. Please send an email or stop by during my scheduled student hours, and I will do my absolute best to help you resolve the issue. If we are unable to find a solution together, the next points of contact should be approached in the following order:



The Carleton University Physics Undergraduate Advisor is Dr. Thomas Gregoire. If you need **any academic** or administrative guidance, please feel free to reach out to Dr. Thomas Gregoire at gregoire@physics.carleton.ca. He can help you with everything from choosing your courses and checking prerequisites to picking the perfect physics stream for your goals.

25 Important Dates

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

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