Electricity, Magnetism and Waves

Physics 1004A Fall 2025

Course Instructor: Dr. Andrew Robinson Hear my name **Office Location:** Herzberg Building HP3368

How to address me: Dr. Robinson or Andrew

Gender Pronouns: (he/him/his) (learn more)

Email: andrew.robinson@carleton.ca

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

Phone: (613) 520-2600 ext. 8922

Student Hours: To be determined

What are 'Student Hours'?
Student hours are dedicated times through the week for the course instructor and TAs to meet with YOU. Pop in to introduce yourself, ask questions about the course, or discuss content from the course.

Note: If these If these times don't work for you, email me and we can arrange an alternate time to meet.

Click here for visual directions.

Class Location:

Click here for visual directions.

Class Times: Tuesday and Thursday, 4.05 pm – 5.25 pm

Prerequisites: See this outline

Preclusions: BIT 1003 (no longer offered), BIT 1007, BIT 1204, PHYS 1002, PHYS 1008

Department/Unit Physics

Physics PHYS 1004 Laboratory, Fall 2025
Location: HP4130
Lab Supervisor: Tamara Rozina
Email: tamararozina@CUNET.CARLETON.CA
Office Hours: 10-11 am, HP3374

Welcome to Physics 1004A

Introduction

This calculus-based course introduces electricity and magnetism with an emphasis on mastering the physics concepts required by students in the engineering programs. This includes electric and magnetic fields and associated forces, potential and potential energy, magnets, electromagnetic induction, alternative current, electric circuits and electromagnetic waves. The associated laboratory and tutorial sessions alternate each week and provide an essential complement to the lectures. Student evaluations are based on labs, tutorial tests, attendance/participation in class and the final exam. Students are required to obtain a satisfactory grade in the laboratory component to pass this course.

Inclusive Teaching

I am committed to fostering an environment for learning that is inclusive for everyone regardless of gender identity, gender expression, sex, sexual orientation, race, ethnicity, ability, age, class, etc. Please email me if you have any comments or concerns.

Land Acknowledgement

We recognize the Algonquin peoples as the traditional custodians of the land in which the campus is located, and where the class is taught. We give respect to the host nation, the *Kitchissippi Omàmiwininì Anishinabeg* (*Algonquin peoples of the big river,* in the Algonquin language).

Prerequisites

Prerequisite(s): MATH 1004, ECOR 1101 or ECOR 1053 or (ECOR 1045 and ECOR 1048) (the ECOR courses may be taken concurrently) or PHYS 1001 or PHYS 1003 or PHYS 1007 (a grade of at least B- is required for PHYS 1007), or permission of the Department.
Students **must** check with Dr Robinson and obtain permission from the Physics Department to remain in the course if they do not fulfil these prerequisites.

Assistance for Students

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

Writing Services: https://carleton.ca/csas/support/

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/

Community Guidelines

The following values are fundamental to academic integrity and are adapted from the International Center for Academic Integrity*. In our course, we will seek to behave with these values in mind:

	As students, we will…	As a teaching team, we will…
Honesty	• Honestly demonstrate our knowledge and abilities on assignments and exams • Communicate openly without using deception, including citing appropriate sources	• Give you honest feedback on your demonstration of knowledge and abilities on assignments and exams • Communicate openly and honestly about the expectations and standards of the course through the syllabus, and with respect to assignments and exams
Responsibility	• Complete assignments on time and in full preparation for class • Show up to class on time, and be mentally/physically present • Participate fully and contribute to team learning and activities	• Give you timely feedback on your assignments and exams • Show up to class on time, and be mentally & physically present • Create relevant assessments and class activities
Respect	• Speak openly with one another, while respecting diverse viewpoints and perspectives • Provide sufficient space for others to voice their ideas	• Respect your perspectives even while we challenge you to think more deeply and critically • Help facilitate respectful exchange of ideas
Fairness	• Contribute fully and equally to collaborative work, so that we are not freeloading off of others • Not seek unfair advantage over fellow students in the course	• Create fair assignments and exams, and grade them in a fair, and timely manner • Treat all students equitably
Trust	• Not engage in personal affairs while on class time • Be open and transparent about what we are doing in class • Not distribute course materials to others without authorization	• Be available to all students when we say we will be • Follow through on our promises • Not modify the expectations or standards without communicating with everyone in the course
Courage	• Say or do something when we see actions that undermine any of the above values • Accept a lower or failing grade or other consequences of upholding and protecting the above values	• Say or do something when we see actions that undermine any of the above values • Accept the consequences (e.g., lower teaching evaluations) of upholding and protecting the above values

* This class statement of values is adapted from Tricia Bertram Gallant, Ph.D.

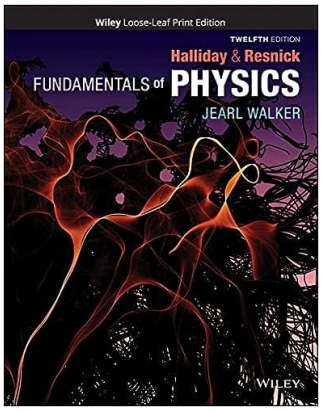
Online Community Expectations for Social Platforms

With the growing use of social platforms (e.g., Discord) on campuses, it is important to keep in mind that university codes of conduct still apply to the behaviours of students online. Please be considerate and respectful while engaging with peers and remember that we are all humans, and that your words matter. If any student witnesses or experiences harassment, I encourage you to reach out to me. Alternatively, you can contact Ombuds Services or Carleton Equity and Inclusive Communities.

Online communities can be highly beneficial to students and can help to facilitate learning within the course. I encourage people to ask questions, learn from one another, and have open discussions about class material. That said, any acts of academic misconduct (i.e., cheating) will not be tolerated and will result in serious consequences ranging from a grade reduction to expulsion (*see academic integrity violations*).

- Examples of appropriate peer-to-peer sharing/learning vary from course to course. In this course appropriate peer-to-peer sharing includes: identifying the proper formula to use, identifying an incorrect or missing step in a person's work, brainstorming potential reasons behind a concept, suggesting helpful sites and videos for learning a concept, posting your own work showing only a specific step or process for illustrative purposes (note: this is very different from posting your work and solution for others to simply copy)
- Examples of unacceptable peer-to-peer sharing: Posting or sharing the answers, indicating which answers are correct on assignments, sharing links to solutions, posting your own complete work for a question/solution

Learning Materials



Textbooks Fundamentals of Physics, 12th edition by Halliday, Resnick and Walker. If you can find a second-hand copy, of either the 9th, 10th or 11th editions, then this will do for this course.

This textbook is available at the University Bookstore. The ISBN number: 978-1119801146

The textbook can be bought new (print for $164 or digital for $135), or rent (digital for $57) at the campus bookstore.

Intellectual Property

Classroom teaching and learning activities, including lectures, discussions, presentations, quiz questions and solutions 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).

i.e. Please don't upload notes, quiz questions or solutions to external sites

Assessment in this Course

Research about learning strongly suggests that the most important factor in learning is doing the work of reading, writing, recalling, practicing, synthesizing, and analyzing. Learning happens best when people actively engage material on a consistent basis, and that is why we have high standards in this course. We are confident that, with appropriate effort, you **all** can meet those standards.

We also try to reduce unintentional bias in grading by using methods such as grading assignments one question at a time (i.e., grading all of question 1 before grading any of question 2), grading anonymously, and using rubrics.

Course Organisation

Lectures

The lectures are on Tuesdays and Thursdays. Attendance is not mandatory but is strongly recommended, and there is a participation grade assigned. Educational research shows that performance in university is strongly correlated with attendance in class. Lectures will be recorded, so you will have the opportunity to review the material. However, the recordings are a pale shadow of the full theatrical experience! We will be using the Wooclap interactive response system to respond to questions, and this will log your in-class participation. You can log into this system using a web browser on a phone, tablet or laptop, or there is an App which you can download.

Weekly Online Quizzes

There are 11 weekly online quizzes in the course to be completed on Brightspace. You will have two attempts. Questions are randomized from a question bank pool, so they will be different in each attempt. These do not count for final grades, but they are provided to help you gauge your own proficiency with the material. At the end of the course, if you are at a grade letter boundary, then evidence of participation and engagement will count favourably for rounding up to the higher grade.

Attendance and Participation

We will be using the Wooclap classroom response system, and you will sign-in using your university credentials. It will record your presence during the classroom session and your responses to the various questions. If you answer 50% of the questions during the lecture, then you will be considered to have participated in that particular lecture. You only need to answer the questions, not necessarily get the right answer. If you participate in 80% (20 out of 24) lectures then you will get a full participation grade, of 10% to the final grade. If you participate in fewer lectures, then the score will be pro-rated accordingly.

The "drop four lectures" criterion is to allow for medical emergencies, appointments, transport problems and so on. You do not need to contact me if you miss a lecture. The lectures will be recorded, and full notes will be available if you cannot make it in person. If there are personal circumstances which lead to you miss more classes, please email me, so we can arrange accommodations. I want people to be in class but realize that this is not always possible for everyone.

In-Class Problems

After each class, I will set a problem which should be solved, and the solution brought to the next class. I will then review the solution, and give a grading scheme, so that you can see how your work measured up to my solution and expectations. You need to be able to solve these problems yourself, as they will form the basis (in modified forms) for questions in the tutorial tests. *There is no point in using AI to do the problems for you, as you will not learn anything, and it will damage your ability to answer test and exam questions effectively*. This course is designed to teach you "how to" yourself. This is an exercise in self-discipline; nobody is going to check whether you did this work. Being able to work without supervision is an essential skill for anyone hoping to get a degree.

Laboratory

The laboratory sessions will be held in the Herzberg Building, room HP4130. If you are unable to attend your designated laboratory, please contact the laboratory supervisor. We do offer make-up labs at the end of the semester. If you have taken the course before and got a satisfactory score on the laboratory component, then you may be eligible for a laboratory exemption, so that you do not need to repeat the lab component again. This is not applied automatically; you must contact the lab supervisor to apply for it.

Lab Section	Day	Time
A1	Tuesday	1305-1555

Tutorial Tests

Tutorials are held on alternate weeks from the laboratory sessions, at the same time and in the same room (HP4130).

The first tutorial session will be a lab introduction, and review of important mathematical concepts used in both the lectures and lab parts of the course. Attendance is mandatory. There will be five tests which are taken during tutorial sessions. These take the place of midterm exams in this course. These are 60-minute tests at the **end** of the tutorial session. They are closed book, but the official formula sheet may be used. University exam conditions are in effect, and you may not communicate with other students during this test. Students with PMC accommodations for extra time will sit this test in the McIntyre Centre.

The lowest score of the five tests will be dropped, and the mean value of the other four tests will be used to calculate your final grade. The tutorial tests are worth 20% of your final grade.

Grade Breakdown

This course marking scheme will be used to evaluate the performance of all students. Requests to deviate from this scheme will be denied, unless there are special circumstances, such as illness. Requests to increase the weighting on the final exam to compensate for poor performance on work during the term will be denied unless there are exceptional circumstances.

You must obtain a passing grade (50%) in the laboratory work to pass the course. If you do not, then you will automatically receive a failing grade, F, regardless of your performance in the other course components.

Component	Grade Value
Participation	10%
Tutorial Tests (drop lowest grade)	20%
LABORATORY	35% (must pass with minimum 50% to pass course)
Final Exam	35%

Final Exams

The final exam will be in-person and will be held during the final examination period. Final exams are scheduled centrally, and I have no control over the date. Please do not book any travel arrangements before the schedule in announced. The exam will be a three-hour closed book exam, with a formula sheet supplied.

Other Assistance

The Physics department runs a Physics Drop-In Centre, staffed by experienced tutors for all first-year students. Details of this will be announced at the start of the semester.

The Faculty of Engineering also runs the Elsie MacGill Learning Centre, which provides similar services for all engineering students.

Elsie MacGill Learning Centre - Academic Support for Engineering Students | Faculty of Engineering and Design (carleton.ca)

Student Hours

I will be available for student hours sessions every week when there are classes. We will determine the times during the first lectures, as this needs to be based on student schedules. These will be online Zoom sessions. I will also be available by email but note that I do not monitor my Carleton email continuously. I try to respond within one business day. I am also happy to chat after lectures.

Feeling Sick?

If you feel very sick (e.g., fever, chills, stomach upset) do not come to class or campus. All lectures are recorded, so you can review them later. Please contact the **lab supervisor** if you are unable to attend a tutorial or laboratory session. We will offer makeup labs at the end of the semester, and we drop the lowest tutorial test, to allow for such eventualities.

Mental Health

If you are struggling, please do not hesitate to reach out. I am happy to listen, and/or direct you to resources that might help. In terms of class, if you need extra help or missed a lesson, don't stress! Email me and we will set a time to meet. I'll work with you, I promise. Remember that Carleton also offers an array of mental health and well-being resources, which can be found here.

University Policies

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

DEF = Deferred

Academic Accommodations, Regulations, Plagiarism, Etc.

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 (students.carleton.ca/course-outline)

- **Deferred/missed term work for short-term accommodation (5 days or less):**

  Send me an email.

- **Deferred/missed term work for longer term incapacitation (5 days or longer):** If you require accommodations for this course that are longer than the 5-day (short-term) period, please email me to discuss how/whether accommodation needs could be met for this course.

Statement on Chat GPT/Generative AI usage

AI Use in this course: Students may use AI tools for basic word processing and formatting functions, including:

- Grammar and spell checking (e.g., Grammarly, Microsoft Word Editor)
- Basic formatting and design suggestions (e.g., Microsoft Word's formatting tools, PowerPoint Design editor)

You must **not** use Generative AI systems to solve the set problems for tutorial tests, or in-class problems.

Documenting AI Use: It is not necessary to document the use of AI for the permitted purposes listed above. If you have questions about a specific use of AI that isn't listed above, please consult your instructor.

Why have I adopted this policy? This policy ensures that student voices and ideas are prioritized and authentically represented, maintaining the integrity of the work produced by students while allowing basic support to enhance clarity, correctness, layout, and flow of ideas. The Large Language Models (LLMs) which go under the general "AI" umbrella do not understand mathematics and numbers and cannot be relied upon to generate correct answers. *You must be able to solve the problems yourself*. Once you understand the basic principles, and can do them yourself, you will be able to correctly identify suitable use-cases

for LLMs and be able to spot when they are incorrect. We are at the "understand the basic principles" part of the educational process.

Academic Integrity

Academic Integrity is upholding the values of honesty, trust, respect, fairness, responsibility, and courage that are fundamental to the educational experience. Carleton University provides supports such as academic integrity workshops to ensure, as far as possible, that all students understand the norms and standards of academic integrity that we expect you to uphold. Your teaching team has a responsibility to ensure that their application of the Academic Integrity Policy upholds the university's collective commitments to fairness, equity, and integrity.
(Adapted from Carleton University's Academic Integrity Policy, 2021).

Examples of actions that do not adhere to Carleton's Academic Integrity Policy include:

- Plagiarism
- Accessing unauthorized sites for assignments or tests
- Unauthorized collaboration on assignment and exams
- Using artificial intelligence tools such as ChatGPT when your assessment instructions say that it is not permitted

Please review the checklist linked here to ensure you understand your responsibilities as a student with respect to academic integrity and this course.

Sanctions for Not Abiding by Carleton's Academic Integrity Policy

A student who has not upheld their responsibilities under Carleton's Academic Integrity Policy may be subject to one of several sanctions. A list of standard sanctions in 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 follow the Carleton University Student Academic Integrity Policy. The Policy is strictly enforced and is binding on all students.

Student Rights & 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.

Important University Dates and Deadlines

Please familiarise yourself with the Academic Calendar here:

The Academic Year (Graduate and Undergraduate Studies) < Carleton University

Course Schedule

Week Beginning	Lecture	Lecture Date	Topic	Tutorial	Labs	Quizzes
Monday 1st Sept	**1**	Thurs 4th Sept	Introduction/Electrostatics	No labs or tutorials		
Monday 8th Sept	**2**	Tues 9th Sept	Coulomb Force	Tutorial 0 (Intro/Review)		
	3	Thurs 11th Sept	Electric Fields			
Monday 15th Sept	4	Tues 16th Sept	Electric Fields and Calculus		Lab 1 (Electrostatics)	1 Electrostatics
	5	Thurs 18th Sept	Lines of Charge			
Monday 22nd Sept	6	Tues 23rd Sept	Gauss's Law 1	Test 1 (Lectures 1 to 5)		2 Electric Fields
	7	Thurs 25th Sept	Gauss's Law 2			
Monday 29th Sept	8	Tues 30th Sept	Work and Energy		Lab 2 (Oscilloscope)	3 Lines Charge/Gauss 1
	9	Thurs 2nd Oct	Potential			
Monday 6th Oct	10	Tues 7th Oct	Potential of Charge Distributions	Test 2 (Lectures 6 to 8)		4 Gauss 2/Energy
	11	Thurs 9th Oct	E-V conversion and Potential Energy			
Monday 13th Oct	12	Tues 14th Oct	Capacitance		Lab 3 (Magnetic Balance)	5 Potential
(Thanksgiving on Monday)	13	Thurs 16th Oct	Capacitance and Dielectrics			
Monday 20th Oct	Fall Break					
Monday 27th Oct	14	Tues 28th Oct	Magnetic Fields 1	Test 3 (Lectures 9 to 13)		6 EPE and Capacitance
	15	Thurs 30th Oct	Magnetic Fields 2			
Monday 3rd Nov	16	Tues 4th Nov	Magnetic Field due to Current		Lab 4 (RC and RLC Circuits)	7 Dielectrics/Mag 1
	17	Thurs 6th Nov	Ampere's Law			
Monday 10th Nov	18	Tues 11th Nov	Induction 1	Test 4 (lectures 14 to 17)		8 Mag 2/3
	19	Thurs 13th Nov	Induction 2			
Monday 17th Nov	20	Tues 18th Nov	LC and RLC Circuits		Lab 5 Ray Optics	9 Ampere/Ind 1
	21	Thurs 20th Nov	Phasors and Transformers			
Monday 24th Nov	22	Tues 25th Nov	Maxwell's Equations	Test 5 (lectures 18 to 21)		10 Ind 2/LC/RLC
	23	Thurs 27th Nov	Solutions of Maxwell's Equations			
Monday 1st Dec	24	Tues 2nd Dec	Refraction and Reflection		Make Up Labs	11 Maxwell's/transformers
	25	Thurs 4th Dec	Revision			
Exam Period 8th Dec - 20th Dec						