

# PHYS 1008B Winter 2025

Elementary University Physics II

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.

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**Course Instructor:** Tong Xu

**How to address me:** Prof. Tong

**Gender Pronouns:** (he/him/his)

**Email:** [tong.xu@carleton.ca](mailto:tong.xu@carleton.ca)

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

**Best Ways to be in Touch:** in class, via email, or during student hours

**Student Hours:**

Tuesdays, 11:00am-12:00, HP3318 (Tong Xu)

Fridays, 11:00am-12:00, HP2420 (Avery Berman)

Students from either session can visit either Professor's student hours.

**Lab Supervisor:** Tamara Rozina

**Email:** [tamara.rozina@carleton.ca](mailto:tamara.rozina@carleton.ca)

**Office Location:** Room 3318, Herzberg Building

**Class Location:** Please check Carleton Central for the room location.

**Class Times:**

PHYS 1008B: Mon & Wed, 4:05pm-5:25pm

**Prerequisites:**

PHYS 1001 or PHYS 1003 or PHYS 1007

Students in this course must have PHYS 1007 or equivalent and are expected to have completed MATH 0107 or MATH 1007 or their equivalent. Otherwise, you must obtain permission of the Physics Department.

*If you have failed Physics 1007 in the 2024 Fall term, you must leave this course.*

**Preclusions:**

PHYS1002, PHYS1004, BIT1007, BIT 1204

**Department/Unit:** Physics

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If you are in the physics programs, you should take PHYS 1002, not PHYS 1008.

*Please feel free to contact me via email or in person to let me know about any experiences you have had related to this class that have made you feel uncomfortable.)*

## I. Topics Covered and Learning Outcomes

This is the second part of a two-term physics course with an emphasis on essentials for scientists in other disciplines. This second part of the course covers Electricity and Magnetism, DC and AC circuits, properties of Electromagnetic radiation and light, optics, elementary quantum physics with introductory concepts of atomic, nuclear, and sub-atomic particles. Applications to other scientific disciplines particularly in the life sciences and real-world examples will be used whenever possible

Detailed list of topics to be covered, including **Lecture schedule** and **homework Due Dates** for each week, can be found at the **end of this document**.

*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.*

## II. Labs

Labs start the week of **January 13, 2025**.

All the experiments will be held in **HP 4160**.

Information about the labs can be found on the LAB Brightspace page:  
*University Physics II (LAB) Winter 2025 [14480:14481:14485:14486]*

It is imperative that all students attend the first lab. You may attend only the section that you are registered in. If you missed a laboratory session, you must contact the Lab Coordinator, Ms. Tamara Rozina ([tamara.rozina@carleton.ca](mailto: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.

Students who are repeating the course might be exempt from the Lab. You are not automatically given a lab exemption – you must apply for it with the Lab Coordinator no later than **January 17, 2025**. Lab exemptions will be considered on a case-by-case basis at the discretion of the Lab Coordinator.

The grade for every lab will be based on a **report**. All reports count toward your total lab grade for the course. **No grade will be dropped**.

All reports must be submitted by the appointed time: **1 week** after the start of the lab session. The penalty for a late lab report is **20% up to the End Date** specified on Brightspace for every lab section report submission. It is the student's responsibility to check when the End Date is for each report. **No reports will be accepted for grading past their End Date.**

Please see the Lab Policy document available on the LAB Brightspace page for further details regarding the labs.

### Lab Schedule

Lab #	Title	Week of	Weight (%)	Report Deadline
1	DC Circuits	January 13, 2025	10	1 week
2	Oscilloscope	January 27, 2025	15	1 week
3	Diffraction Grating	February 10, 2025	25	1 week
4	Ray Optics	March 3, 2025	25	1 week
5	Photoelectric Effect	March 17, 2025	25	1 week

### III. Assessments

The four types of assessments are related to the theory part of the course: in-class participation, tutorial tests, homework and final exam.

#### In-class participation

During every lecture, there will be live interactive questions. Students will answer questions through Wooclap platform

The in-class participation account for 10% of the final marks:

- You will get most of the participation marks (6%) if you answered the questions in each of 16 lectures (out of total 23 lectures), even if you got them wrong. If less than 16 lectures, the 6% will be scaled accordingly.
- The remaining of the participation marks (4%) will be based on your performance (% of correct answers) in your top 16 lecture quizzes.

**Team discussion is encouraged when working on these in-class questions.**

Every Registered Carleton Student should have a [Wooclap.com](https://wooclap.com) account. At beginning of the lecture, a Wooclap event code will be given. **You must join the event using your Carleton email (your\_username@cmail.carleton.ca) and your Carleton password for your participation to be recorded.** To save time, I suggest you login to wooclap.com before the lecture start.

## Tutorials

There will be a tutorial on each alternating week with the labs (see lab and tutorial schedule below). All the sessions will be held **in-person** in room **HP 4160**.

The structure of the tutorial is as follows:

A set of tutorial problems will be posted on BrightSpace at least a week before the tutorial session. Students should attempt to solve these problems in order to prepare for the tutorial. **At the start of the tutorial session students will individually complete a multiple-choice (MC) quiz consisting of 4 questions.** The MC quizzes are open book and designed for a 15-minute completion time. Next, the TAs will demonstrate solving example problems and answering questions about the tutorial problem set. The last hour of the tutorial will be a close-book tutorial test consisting of two long-answer problems.

The grade for the tutorial test and the multiple-choice quiz will be combined to provide the final Tutorial Test grade for each of the 5 tutorial sessions this semester. **The 4 highest test grades** will be used to determine the final Tutorial Test score.

**After your tutorial tests are returned, you are expected to keep them at least until the end of term.** Please verify their marks entry on Brightspace and bring any clerical errors to our attention as soon as you can during the term.

**Note that if you are late for the tutorial, you will miss the multiple-choice quiz, and forfeit marks. There are no retakes possible.**

Students must attend the tutorial session only in the lab section they are registered in. The final grade for tutorials is based on best 4 out of 5 sessions. If a student missed a session, then this session will automatically be dropped and the other 4 will count towards the final grade. If a student had to miss a second session, they must reach out to the Lab Coordinator, Ms. Tamara Rozina ([tamara.rozina@carleton.ca](mailto:tamara.rozina@carleton.ca)) **immediately** to discuss possible options.

Tutorial schedule

Week of	Tutorial
January 6, 2025	NO Labs/Tutorials
January 20, 2025	Tutorial 1
February 3, 2025	Tutorial 2
February 17, 2025	Winter Break

February 24, 2025	Tutorial 3
March 10, 2025	Tutorial 4
March 24, 2025	Tutorial 5
March 31, 2025	Review (no test)

## Homework

There are 12 weekly Homework (HW) which are online quizzes administered through Brightspace. These HWs will count as the HW grade in the final course grade. The HWs will be based on material studied during the lectures during that week. Each HW will become available every Wednesday of the week for the students to attempt. You will have 2 attempts during the week before the HW due the next Wednesday. All 12 HWs less the (2) lowest HWs will count toward the final grade of Homework. See the timetable for the lectures further in this document. Be vigilant and be sure to always check the due dates for the HWs. If there is any discrepancy between the marks posted in the Brightspace gradebook and your calculated values, please notify the instructor immediately.

## Final Exam (In Person)

There is no mid-term examination. We regard the five tutorial tests as a way of providing feedback and guidance on your performance. If you do not perform to your own satisfaction on a tutorial test, it is imperative to discuss this with your lecturer during office hours or by email. Do not leave this consultation until the end of the course. Effective intervention and assistance are best applied at the beginning of term.

The final examination will be scheduled during the regular April examination period at the end of the term. It is the responsibility of the student to be present during this period; in particular, holiday travel arrangements must not be made before the examination schedule is known.

The final exam may include questions related to material contained within the lab portion of the course.

## IV. Grade Breakdown

In-class participation	10%
HWs (Homework Quizzes) (best 10 out of 12)	15%
Tutorial tests (best 4 out of 5)	15%
Labs (5)	35%
Final Exam	25%
<b>Total</b>	<b>100%</b>

If you miss a lab or homework for a reason that justified for accommodation, you need to let your instructor, or the lab supervisor know within 1 week from the deadline of the missing work. or you receive Zero mark for that missing work.

## Passing Condition

To pass the course, students must meet the following conditions:

- An overall mark must be **greater than 50%**, **AND**
- Must achieve **40%** or more on **BOTH** the Theory ( $\geq 26/65$  marks) **AND** the Lab ( $\geq 14/35$  marks) components of the course. **Achieving more the 40% but less than 50% in either Lab or Theory while achieving 50% or more overall will translate into a grade of D-.** (NOTE: Theory includes Assignments, Reading Quizzes, Tutorial Tests, and the Final Exam)
- **Final Exam must be attempted** to pass the course, even if you manage to achieve 50% overall mark without the final exam.

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

Learning Material	Options for Purchasing	Approximate Cost
<b><i>Physics, Fifth Edition, Alan Giambattista, McGraw Ryerson Ltd., ISBN: 9781260570052</i></b>	<a href="#">Carleton Book Store</a> (ISE new)	\$117.50
	Carleton Book Store (rent, digital, 180day)	\$93.25
	Carleton Book Store (loose page, new)	\$104.00
	Carleton Book Store (buy digital)	\$145.50

*Second-hand copy of the textbook is fine for this course.*

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## 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/>).

### AI and Chat GPT are not allowed for solving HW question

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that 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 & 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.



## Lecture and homework schedule:

Week	Date for Phys 1008 A & Phys 1008 B		Lecture #	Text Section	Topic	Deadline HW due every Wednesday for both 1008A&B	
1	Mon Jan 6 & Wed Jan 8		1		Course Introduction and Math Concepts		
				16.1	Electric Charge		
				16.2	Conductors and Insulators		
	16.3	Coulomb's Law					
	Wed Jan 8 & Fri Jan 10		2	16.3	Coulomb's Law (continued)		
			16.4	Electric Field			
				16.5	Motion of Charge in <b>E</b> field		
2 (Lab 1)	Mon Jan 13 & Wed Jan 15		3	16.6	Conductors in electrostatic equilibrium	HW1, Intro & Ch 16 is due Wed Jan 15	
				16.7	Gauss' Law for electric fields		
				17.1	Potential Energy		
	Wed Jan 15 & Fri Jan 17		4	17.2	Potential		
				17.3	Field and Potential		
				17.4	Conservation of Energy; moving charges		
3 (Tutorial Chs. 16-17.3)	Mon Jan 20 & Wed Jan 22		5	17.4	Conservation of Energy; moving charges (cont.)		
				17.5	Capacitors		
				17.6	Dielectrics		
				17.7	Energy in a Capacitor		
	Wed Jan 22 & Fri Jan 24		6	18.1	Current		HW2, Ch 16 is due Wed Jan 22
				18.2	EMF & Circuits		
				18.4	Resistance & Resistivity		
				18.5	Kirchhoff's Rules		
4 (Lab 2)	Mon Jan 27 & Wed Jan 29		7	18.6	Series and Parallel Circuits		
				18.8	Power and Energy in Circuits		
				18.10	RC Circuits		
	Wed Jan 29 & Fri Jan 31		8	18.11	Electrical Safety		HW3, Ch 17 is due Wed Jan 29
				19.1	Magnetic Fields		
				19.2	Magnetic Force on a point charge		
				19.3	Charged particle moving perp to a uniform <b>B</b> field		
5 (Tut 2 Chs. 17.4, 18, 19.2)	Mon Feb 3 & Wed Feb 5		9	19.4	Charged particle in a uniform magnetic field		
				19.5	Charged particle in crossed <b>E</b> and <b>B</b> fields		
				19.8	Magnetic field due to an electric current		
				20.3	Faraday's Law		
				20.4	Lenz's Law		
	Wed Feb 5 & Fri Feb 7		10	20.4	Lenz's Law (continued)		HW4, Ch 18 is due Wed Feb 5
				20.9	Inductance		
				21.1	AC currents and voltages, with resistors		

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6(Lab 3)	Mon Feb 10 & Wed Feb 12	11	21.3	Capacitors in AC	HW5, Ch 19 is due Wed Feb 12		
	Wed Feb 12		21.4	Inductors in AC			
			22.3	EM spectrum			
	Wed Feb 12 & Fri Feb 14	12	22.4	Speed of EM waves			
			22.5	Travelling EM waves in a vacuum			
			22.6	Intensity (part of section)			
22.7			Polarization				
<b>Week of February 17-21 - Winter Study Break (No classes or tests)</b>							
8 (Tut 3 Chs. 19,20,21 )	Mon Feb 24 & Wed Feb 26	13	23.1	Wavefronts and Rays	HW6, Chs 20, 21 is due Wed Feb 26		
	Wed Feb 26 & Fri Feb 28		14	23.2		Reflection	
				23.3		Refraction	
	Wed Feb 26 & Fri Feb 28	23.4	Total Internal Reflection (TIR)				
9 (Lab 4)	Mon Mar 3 & Wed Mar 5	15	23.9	Thin lenses (cont.)	HW7, Chs 21, 22 is due Wed Mar 5.		
			24.1	Lenses in combination			
			24.3	The Human Eye			
			24.4	Simple magnifier			
	Wed Mar 5 & Fri Mar 7	16	24.5	Compound microscopes (qualitative only)			
			25.1	Constructive and destructive interference			
10 (Tut 4 Chs 22,23,24)	Mon Mar 10 & Wed Mar 12	17	25.4	Young's Double Slit	HW8, Ch 23 is due Wed. Mar 12		
			Wed Mar 12 & Fri Mar 14	18		25.5	Gratings
						25.8	Resolution of optical instruments
	Mon Mar 17 & Wed Mar 19	19	27.2	Blackbody radiation			
			27.3	Photoelectric effect			
			27.6	Spectroscopy			
27.7			Bohr model: atomic electron energy levels, transitions				
11 (Lab 5)	Wed Mar 19 & Fri Mar 21	20	27.7	Atomic Structure	HW9, Chs 24-25 is due Wed Mar 19		
			28.1	Wave particle			
			28.2	Matter waves (de Broglie)			
			28.3	Electron microscope			
12 (Tut 5 Chs 25,27,28)	Mon Mar 24 & Wed Mar 26	21	28.4	Uncertainty Principle	HW10, Chs 25-27 is due Wed. Mar 26		
			Wed Mar 26 & Fri Mar 28	22		28.5	Wave functions: confined particle
						28.6	Hydrogen Atom
						28.7	Exclusion Principle
	Mon Mar 24 & Wed Mar 26	21	28.9	Lasers			
			28.10	Tunneling			
			29.1	Nuclear structure			
			29.2	Binding Energy			
Wed Mar 26 & Fri Mar 28	22	29.3	Radioactivity				
		29.4	Decay rates and half life				
		29.5	Biological effects of ionizing radiation				
		29.7	Nuclear Fission				
13 (Review Tut)	Mon Mar 31 & Wed Apr 2	23	29.8	Nuclear Fusion	HW11, Chs 27-28 is Wed Apr 2		
			30.1	Fundamental Particles (optional)			
			30.2	Fundamental Interactions (optional)			
			30.3	Beyond the Standard Model (optional)			
	30.4	Particle Accelerators (optional)					
Wed Apr 2 & Fri Apr 4	24		Review				

14	Mon Apr 7	25		Review (1008B only)	
					HW12 Chs 28-29 is due <b>Tues Apr 8</b>

**Additional tips:**

**Numerical Answers in HW quizzes**

In answering the assignment calculation questions, you will encounter the situation where you must enter a numerical value as the response. Please enter the answer when appropriate in scientific notation with the correct number of significant figures. By default, THREE sig. fig. is required, unless specified otherwise in the question. For example, if your answer is  $1.60 \times 10^{-19} \text{ C}$ . You will input your answer as

Your Answer:

You are allowed a 5% variance between your answer and the one calculated within Brightspace to account for rounding errors. If you do not give your answer with three significant figures, your answer may be outside of this 5% threshold and will therefore be marked as incorrect. Answers of this sort will not be eligible for re-assessment by the professor. In some question you will be asked to use a specific number of decimal points instead of using sig. figs. You need to abide by the stated-required digital precision.

Be sure always to take careful note of the units for your answer. Some questions will ask you to input units of your answer, while some others will only ask for the numerical result. Typically, it is expected that the answer will follow SI units (m, s, J, V, A, etc.) however there are occasions in which non-standard units will be required for the specific question. Generally, these instances will be noted in the question itself, e.g. “Express your answer in km”. Also, units are not to be entered with the numerical answer for these assignments! If required, please input the unit in the specified box.

**Scientific notations in the question text**

Due to the limitation of BrightSpace’s capability of displaying scientific notations, you may see the following in the questions text.

BrightSpace display in the question text	Actual value
2.50x10 <sup>-5</sup>	2.50x10 <sup>-5</sup>
2.50x10 <sup>0</sup> Unfortunately, BS still displays the exponent term even it is 10 to the power of zero. So just treat 10 <sup>0</sup> =1.0	2.50

$(2.50 \times 10^0) \times 10^2$ , or $(2.50 \times 10^0)E2$ , or $(2.50 \times 10^0) \times 10^2$ Some time you may see such mixed display, again, note that $10^0 = 1.0$ .	$2.50 \times 10^2$
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**Scientific Calculators:**

It is highly recommended that you use and understand the functionality of a reliable scientific calculator for all calculations on assignments and tests. It is good practice to fully understand how to use the scientific notation functionality that all scientific calculators will have available. This will save a great deal of time in all your calculations and greatly reduces mistakes.