

Elementary University Physics II

PHYS 1008A

Summer 2022

Course Outline

1. Course calendar description and pre-requisites

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. Precludes additional credit for BIT 1003 (no longer offered), [BIT 1007](#), [BIT 1204](#), [PHYS 1002](#), [PHYS 1004](#).

Pre-requisites: [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 2021 Fall term, you must leave the course.*

2. Instructors contact information

Instructor office hours will be posted on BrightSpace

Mustafa Bahran	PHYS 1008A lecturer	Mustafa.Bahran@carleton.ca
Tamara Rozina	Lab Supervisor	tamara.rozina@carleton.ca

In accordance with university policy, all communication with instructors and TAs must be 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.

To help resolve issues related to any missing term work, students must save all of their email correspondence with instructors and TAs until the course grades are finalized.

3. Course textbook

'Physics', Fifth Edition (International Student Edition), Giambattista, McGraw Ryerson Ltd,
ISBN: 9781260570052 (hardcover), 9781260486964 (e-text), 9781260327762 (hardcover + e-text)

These can be purchased from the Carleton University Bookstore in the University Centre (<https://www.bkstr.com/carletonstore>)

The previous version of the textbook (3rd edition, ISBN 9780073512150) is also sufficient. We will not be using the Publisher's website for assignments, so no access code is required. Please note that the equation numbering in the 3rd edition is different than the current edition used.

4. Course website

The course outline and other course information will be posted on BrightSpace. We reserve the right to amend the course outline on BrightSpace 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

5. Course modality

This course is in person course where there are a series of in person meetings (lectures, and labs). HomeWorks (HWs) and pre-class reading quizzes (RQs) will be online in Brightspace. The specific dates and activities are described further on in this course outline. Students are expected to remain up to date with the deadlines and due dates provided by the instructor.

It must be said, learning physics is a very active process! Everyone one can do it with some effort. You all can do it. You will need to take the lead in this effort. Ask questions whenever you need help! Watching someone else "do physics" does not often do much for you! Once you realize that PHYSICS is really fun as you see it in every day's life then you will know that you have understood it.

Please note that summer course is a very condensed (shorter time than Fall and Winter courses) and hence students must keep up with learning every day and not let go until after the final exam.

6. Lecture schedule

PHYS 1008A	Mondays and Wednesdays 06:05 – 08:55 pm, room RB2200
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* All timeslots are in the Eastern Time zone

7. Lab

Lab Outline

Labs start the week of **July 4, 2022**.

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

Information about the labs can be found on the LAB Brightspace page:

Merge PHYS1008A1:PHYS1008A2:PHYS1008A3 University Physics II (LAB) [21464:21465:21466] Summer 2022

It is imperative that all students attend the first lab. You can only attend the section that you are registered in. All changes (exemptions, etc.) must be arranged with the Lab Supervisor, Ms. Tamara Rozina at the start of term. If you have a documented reason for missing a laboratory session, you must contact Ms. Rozina **immediately**. A make-up session may be arranged at the end of term in these cases. If you do not have documentation, you will not be permitted to take a makeup session, and you will receive a mark of zero for that experiment.

Students who might be exempt from the Lab (if they are repeating the course, for example) must contact the Lab Supervisor. You are not automatically given a lab exemption - you must apply for it no later than **July 8, 2022**. Lab exemptions will be considered on a case-by-case basis at the discretion of the Lab Supervisor.

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 for **labs 1- 4** and **24 hours** for **lab 5**. 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.**

Lab Schedule

Lab #	Title	Due	Weight (%)	Week of
1	DC Circuits	1 week	10	July 4, 2022
2	Oscilloscope	1 week	15	July 11, 2022
3	Diffraction Grating	1 week	25	July 18, 2022
4	Ray Optics	1 week	25	July 25, 2022
5	Photoelectric Effect	24 hours	25	August 1, 2022

8. Lectures and Assignments:

In-person lectures:

The lectures will be given in person at the assigned time slots every week according to the schedule in Section 6 of this course outline. It is important that the students attend the lectures as they are given to derive the greatest benefit from the course. In addition to the lecture, there will be in person office hours session. In Section 14 of the course outline is a schedule for the topics that will be covered each week and the corresponding lectures. Students should read the necessary chapter material prior to attending the synchronous lecture sessions.

Pre-Class Reading Quiz

Each week will contain 2 or more "Pre-Class Reading Quiz" (RQ), to allow the student to check on their understanding of the material prior to starting the work in the chapter which means students need to scan-read the chapter prior to coming to class. **Please note that the RQ covers only the sections that will be covered in class as indicated in section 14.** There will be 12 RQs in total. Doing these RQs will count as a participation grade in the final course grade. These quizzes are to ensure that you have read the designated chapter(s) prior to taking the class. There will only be one attempt at these RQs and all RQs less the (2) lowest quiz will count toward the final grade (time allocated will be 45 to 60 minutes). The questions will be conceptually based in general and sometimes calculations will be needed to complete an individual question. The first RQ is particularly more difficult in order to test if you are ready for the course.

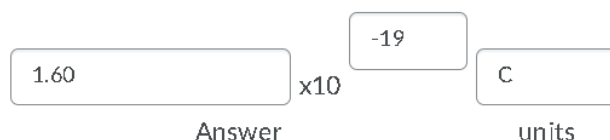
Homeworks

In addition to the RQs, there are 12 Homeworks (HWs) which are assignment 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. You will have 2 attempts per each HW. All 12 HWs less the (2) lowest HWs will count toward the final grade of the HW. See the timetable 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.

Numerical Answers

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 1.60×10^{-19} 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, 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 ⁻⁵	2.50x10 ⁻⁵
2.50x10 ⁰	2.50

Unfortunately, BS still displays the exponent term even it is 10 to the power of zero. So just treat $10^0 = 1.0$	
$(2.50 \times 10^0) \times 10^2$, 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 $10^0 = 1.0$.	2.50×10^2

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.

9. Final Exam

There is no mid-term examination.

The final examination will be scheduled during the regular August examination period at the end of the term. It is the responsibility of the student to be present during this period; that is to say: students must attend the final exam.

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

10. Marking Scheme

HWs (Assignment Quizzes) (Best 10 out of 12)	25%
Labs (5)	35%
Pre-Class Chapter Reading Quizzes (Best 10 out of 12)	15%
Final Exam	25%
Total	100%

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.



11. Passing Condition

In order to pass the course, students must meet the following conditions:

An overall mark must be ***greater than 50%***, AND

Must achieve ***40% or above*** on *BOTH* the Theory ($\geq 28/70$ marks) *AND*

the Lab ($\geq 12/30$ 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.



14. Lecture schedule:

Lecture # and date	Text Section	Topic	Deadline
1 Monday July 4		Course Introduction and Math Concepts	RQ1 Ch 16 is due Mon. July 4
	16.1	Electric Charge	
	16.2	Conductors and Insulators	
	16.3	Coulomb's Law	
	16.3	Coulomb's Law (continued)	
	16.4	Electric Field	
2 Wednesday July 6	16.5	Motion of Charge in E field	RQ2 Ch 17 is due Wed. July 6 HW1, Intro & Ch 16 is due Wed. July 6
	16.6	Conductors in electrostatic equilibrium	
	16.7	Gauss' Law for electric fields	
	17.1	Potential Energy	
	17.2	Potential	
3 Monday July 11	17.3	Field and Potential	RQ3 Ch 18 due Mon. July 11 HW2, Ch 16 is due Mon. July 11
	17.4	Conservation of Energy; moving charges	
	17.4	Conservation of Energy; moving charges (cont.)	
	17.5	Capacitors	
	17.6	Dielectrics	
	17.7	Energy in a Capacitor	
	18.1	Current	
	18.2	EMF & Circuits	
4 Wednesday July 13	18.4	Resistance & Resistivity	RQ4 Ch 19 is due Wed. July 13 HW3, Ch 17 is due Wed. July 13
	18.5	Kirchhoff's Rules	
	18.6	Series and Parallel Circuits	
	18.8	Power and Energy in Circuits	
	18.10	RC Circuits	
	18.11	Electrical Safety	
	19.1	Magnetic Fields	
5 Monday July 18	19.2	Magnetic Force on a point charge	RQ5 Chs 20, 21 is due Mon. July 18 HW4, Ch 18 is due Wed. July 18
	19.3	Charged particle moving perp to a uniform B field	
	19.4	Charged particle in a uniform magnetic field	
	19.5	Charged particle in crossed E and B fields	
	19.8	Magnetic field due to an electric current	
	20.3	Faraday's Law	
	20.4	Lenz's Law	
	20.4	Lenz's Law (continued)	
20.9	Inductance		
	21.1	AC currents and voltages, with resistors	



6 Wednesday July 20	21.3	Capacitors in AC	RQ6 Ch 22 is due Wed July 20 HW5, Ch 19 is due Wed. July 20
	21.4	Inductors in AC	
	22.3	EM spectrum	
	22.4	Speed of EM waves	
	22.5	Travelling EM waves in a vacuum	
	22.6	Intensity (part of section)	
	22.7	Polarization	
7 Monday July 25	23.1	Wavefronts and Rays	RQ7 Ch 23 is due Mon. July 25 HW6, Chs 20, 21 is due Mon. July 25
	23.2	Reflection	
	23.3	Refraction	
	23.4	Total Internal Reflection (TIR)	
	23.9	Thin lenses	
8 Wednesday July 27	23.9	Thin lenses (cont.)	RQ8 Chs 24, 25 is due Wed July 27 HW7, Chs 21, 22 is due Wed. July 27
	24.1	Lenses in combination	
	24.3	The Human Eye	
	24.4	Simple magnifier	
	24.5	Compound microscopes (qualitative only)	
	25.1	Constructive and destructive interference	
	25.4	Young's Double Slit	
25.5	Gratings		
Monday Aug. 1st		Statutory Holyday	
9 Wednesday August 3	25.8	Resolution of optical instruments	RQ9 Ch 27 is due Wed Aug. 3 HW8, Ch 23 is due Wed. Aug. 3
	27.2	Blackbody radiation	
	27.3	Photoelectric effect	
	27.6	Spectroscopy	
	27.7	Bohr model: atomic electron energy levels, transitions	
	27.7	Atomic Structure	
10 Monday August 8	28.1	Wave particle duality	RQ10 Ch 28 is due Mon. Aug. 8 HW9, Chs 24-25 is due Mon. Aug. 8
	28.2	Matter waves (de Broglie)	
	28.3	Electron microscope	
	28.4	Uncertainty Principle	
	28.5	Wave functions: confined particle	
	28.6	Hydrogen Atom	
	28.7	Exclusion Principle	
	28.9	Lasers	
11 Wednesday August 10	28.10	Tunneling	RQ 11 Ch 29 is due Wed Aug. 10 HW10, Chs 25-27 is due Wed. Aug. 10
	29.1	Nuclear structure	
	29.2	Binding Energy	
	29.3	Radioactivity	
	29.4	Decay rates and half life	
	29.5	Biological effects of ionizing radiation	
	29.7	Nuclear Fission	
	29.8	Nuclear Fusion	
12 Monday August 15	30.1	Fundamental Particles	RQ 12 Ch 30 is due Mon. Aug. 15 HW11, Chs 27-28 is due Mon. Aug. 15
	30.2	Fundamental Interactions	
	30.3	Beyond the Standard Model	
	30.4	Particle Accelerators	
		Review	



Wednesday August 17		No Lecture	HW12 Chs 28-29 is due Wed. Aug. 17
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15. 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)

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 Accommodations for Students with Disabilities:

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation.

If you are already registered with the PMC, contact your PMC coordinator to send your *Letter of Accommodation* at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (*if applicable*).

<https://carleton.ca/pmc/>

*The deadlines for contacting the Paul Menton Centre regarding accommodation for final exams for the Winter exam period is **March 16, 2022**.

For Religious Obligations:

Students requesting academic accommodations on the basis of religious obligation should make a formal, written request to their instructors for alternate dates and/or means of satisfying academic requirements. Such requests should be made during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist, but no later than two weeks before the compulsory event.

Accommodation is to be worked out directly and on an individual basis between the student and the instructor(s) involved. Instructors will make accommodations in a way that avoids academic disadvantage to the student.

Students or instructors who have questions or want to confirm accommodation eligibility of a religious event or practice may refer to the Equity Services website for a list of holy days and Carleton's Academic Accommodation policies, or may contact an Equity Services Advisor in the Equity Services Department for assistance.

carleton.ca/equity/wp-content/uploads/Student-Guide-to-AcademicAccommodation.pdf

For Pregnancy:

Pregnant students requiring academic accommodations are encouraged to contact an Equity Advisor in Equity Services to complete a letter of accommodation. The student must then make an appointment to discuss her needs with the instructor at least two weeks prior to the first academic event in which it is anticipated the accommodation will be required.

carleton.ca/equity/wp-content/uploads/Student-Guide-to-AcademicAccommodation.pdf

Plagiarism:

Plagiarism is the passing off someone else's work as your own and is a serious academic offence. For the details of what constitutes plagiarism, the potential penalties and the procedures refer to the section on Instructional Offences in the Undergraduate Calendar.

What are the Penalties for Plagiarism?

A student found to have plagiarized an assignment may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; and/or a reprimand; a refusal of permission to continue or to register in a specific degree program; academic probation; award of an FNS, Fail, or an ABS.

What are the Procedures?

All allegations of plagiarism are reported to the Dean of Faculty of Science. Documentation is prepared by instructors and/or departmental chairs.

The Dean writes to the student and the University Ombudsperson about the alleged plagiarism.

The Dean reviews the allegation. If it is not resolved at this level, then it is referred to a tribunal appointed by the Senate.

Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy (see <https://carleton.ca/registrar/academicintegrity/>). The Policy is strictly enforced and is binding on all students. Plagiarism and cheating – presenting another’s ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration or completing work for another student – weaken the quality of the undergraduate degree. Academic dishonesty in any form will not be tolerated. Students who infringe the Policy may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; a refusal of permission to continue or to register in a specific degree program; academic probation; or a grade of Failure in the course.

Assistance for Students:

Academic and Career Development Services: <https://carleton.ca/career>

Writing Services: <http://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/>

Important Information:

- Student or professor materials created for this course (including presentations and posted notes, labs, case studies, assignments, and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).
- Students must always retain a hard copy of all work that is submitted.
- 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.
- 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.

Important Dates for 2021/2022 academic year:

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