

Elementary University Physics II

PHYS 1008A/PHYS 1008B

Winter 2021 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. Prerequisites: 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 2020 Fall term, you must leave the course.*

2. Instructors contact information

Instructor office hours will be posted on CuLearn

Mustafa Bahran	PHYS 1008A lecturer	Mustafa.Bahran@carleton.ca
Alan Madej	PHYS 1008B lecturer	alan.madej@carleton.ca amadej@physics.carleton.ca
Tamara Rozina (lab coordinator)	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 cuLearn. We reserve the right to amend the course outline on cuLearn 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 cuLearn will be taken as the definitive version.

If you are unable to access cuLearn 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 an online course where there are a series of synchronous meetings (lectures, tutorials, and labs). In addition, an asynchronous activity is available (posted recorded lectures). Students need to be prepared to meet online via web conferencing tools at scheduled days and times. The specific dates and activities are described further on in this course outline. The asynchronous activities are intended to provide flexibility to students in the event it is not possible to attend the lecture in real time. Students are

expected to remain up to date with the deadlines and due dates provided by the instructor. These courses require reliable high-speed Internet access and a computer.

6. Lecture schedule^{*}

Section	Time Slot	Platform
PHYS 1008A	Wednesdays and Fridays 13:05 – 14:25	Via Zoom link on Dr. Bahran's section of CuLearn
PHYS 1008B	Wednesdays and Fridays 10:05 – 11:55	Via Zoom link on Dr. Madej's section of CuLearn

* All timeslots are in the Eastern Time zone

Web conferencing sessions in this course may be recorded and made available only to those within the class. Please attend the Zoom meeting with your regular name displayed. Unrecognized names not in the class list will not be allowed to join. Sessions may be recorded to enable access to students with internet connectivity problems, who are based in different time zone, and/or who have conflicting commitments. If students wish not to be recorded, they need to leave their camera and microphone turned off.

You will be notified at the start of the session when the recording will start.

Please note that recordings are protected by copyright. The recordings are for your own educational use, but you are not permitted to publish to third party sites, such as social media sites and course materials sites.

7. Labs

Labs start the week of **January 18, 2021**. Your Lab Supervisor for the Labs and Tutorials will be **Ms. Tamara Rozina** for all sections.

Information about the labs can be found on the LAB cuLearn page. All the sessions will be held via a BigBlueButton (BBB) session available on that page.

Information on using BBB can be found at:

<https://carleton.ca/culearnsupport/students/bigbluebutton/>

It is imperative that all students attend the first lab. You may attend only 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. Students who might be exempt from the Lab (if they are repeating the course, for example) must contact the Lab Supervisor.

Lab section	Time slot
L1	Wednesdays 14:35 – 17:25
L2	Tuesdays 08:35 – 11:25
L3	Thursdays 14:35 – 17:25
L5	Thursdays 08:35 – 11:25
L6	Tuesdays 14:35 – 17:25

You are not automatically given a lab exemption - you must apply for it no later than **January 22, 2021**. Lab exemptions will be considered on a case-by-case basis.

The grade for every lab will be based on a **quiz (10%)** and a **report (90%)**. All lab work (reports and quizzes) count towards your total lab grade for the course. **No grade will be dropped.**

All lab work must be completed by the appointed time: **1 week** after the lab session for reports and **24 hours** after the lab session for the quizzes. The penalties for late submission of the lab report is **30% of the grade**.

If you miss a lab, contact Ms. Rozina immediately.

8. Lab Schedule

Lab #	Title	Weight (%)	Week of
1	DC Circuits and Resistance	10	January 18, 2021
2	Properties of Charge Carriers	15	February 1, 2021
3	Properties of Light	25	February 22, 2021
4	Simple Lenses	25	March 8, 2021
5	Photoelectric Effect	25	March 22, 2021

9. 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 via a BigBlueButton (BBB) session available on the CuLearn Lab page.

The structure of the tutorial is as follows:

A set of tutorial problems will be posted on CuLearn 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 quiz consisting of 4 questions. This is open book and lasts for 30 minutes. Next, the TAs will demonstrate solving example problems and answering questions about the tutorial problem set. The last hour of the tutorial will be an open-book tutorial test consisting of two long-answer problems. **Open book means that you can use your notes, textbook, the formula sheet, and a scientific calculator. No other aids are permitted.**

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.

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 normally attend the tutorial only in the lab section to which they belong. To be able to attend a different section, students must obtain permission from the lab coordinator (tamara.rozina@carleton.ca). Such permission will usually be granted only for emergencies or medical reasons. So, if you cannot attend your own lab section one week due to e.g. medical reasons, let us know AS SOON AS POSSIBLE so that you can be rescheduled to a different section.

Lab and Tutorial schedule

Week of	Lab/Tutorial
January 4, 2021	NO Labs/Tutorials
January 11, 2021	NO Labs/Tutorials
January 18, 2021	Resistance in DC Circuits
January 25, 2021	Tutorial 1

February 1, 2021	Properties of Charge Carriers
February 8, 2021	Tutorial 2
February 15, 2021	Winter Break
February 22, 2021	Properties of Light
March 1, 2021	Tutorial 3
March 8, 2021	Lenses
March 15, 2021	Tutorial 4
March 22, 2021	Photoelectric effect
March 29, 2021	Tutorial 5
April 2, 2021	No Tutorial on that day- University Closed
April 5, 2021	Review

10. Lectures

The lectures will be given in real time at the assigned time slots given for two sessions every week according to the schedule in Section 6 of this course outline for each assigned section. It is important that the students attend the lectures as they are given to derive the greatest benefit from the course. The actual lectures will be recorded to video and will be available online after the class is given. In addition to the lecture, each instructor will have synchronous Office hour sessions (via BigBlueButton). 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.

Each chapter will contain a short “Reading Quiz”, to allow the student to check on their understanding of the material prior to starting the work in the chapter. **Please note that the reading quiz covers only the sections that will be covered in class as indicated in section 14.** The Quiz will close 1 hr prior to the lecture starting the material of a particular Chapter. Doing these chapter quizzes 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 quizzes and all quizzes less the (1) 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 Chapter Quiz is particularly more difficult in order to test if you are ready for the course.

In addition to the Reading Quizzes, there are a number of weekly “**Assignment Quizzes**”. These assignment quizzes will count as the assignment grade in the final course grade. These will be administered through CuLearn. The assignments will be based on material studied during the lectures during that week. The assignments will become available at the beginning of the week for the students to attempt. You will have 2 attempts during the week before the assignment closes. all quizzes less the (1) lowest quiz will count toward the final grade of the assignment. See the timetable for the lectures further in this document. Be vigilant and be sure to always check the due dates for the assignments. There will be an assignment scheduled on a weekly basis. If there is any discrepancy between the marks posted in the CuLearn 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 three significant figures e.g. **1.60E-19** for 1.6×10^{-19} . You are allowed a 5% variance between your answer and the one calculated within cuLearn 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.

Be sure always to take careful note of the units for your answer. 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!

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.

11. Final Exam

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.

12. Marking Scheme

Assignment Quizzes (best 11 out of 12)	20%
Tutorials (best 4 out of 5)	25%
Labs (5)	30%
Chapter Reading Quizzes (best 13 out of 14)	5%
Final Exam	20%
Total	100%

13. Passing Condition

In order to pass the course, students must attempt the quiz and hand in a report for **all labs**. Missing labs must be accounted for by making alternate arrangements with the Lab Supervisor. In addition, you must have:

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.

(**NOTE:** Theory includes Assignments, Reading Quizzes, Tutorial Tests, and the Final Exam)

14. Lecture schedule:

Week	Date for Phys 1008 A & Phys 1008B	Lecture #	Text Section	Topic	Deadline
1	Wed Jan 13	1		Course Introduction and Math Concepts	
			16.1	Electric Charge	
			16.2	Conductors and Insulators	
			16.3	Coulomb's Law	
	Fri Jan 15	2	16.3	Coulomb's Law (continued)	
			16.4	Electric Field	
			16.5	Motion of Charge in E field	
2 (Lab 1)	Wed Jan 20	3	16.6	Conductors in electrostatic equilibrium	Reading Quiz Chapter 17 is due
			16.7	Gauss' Law for electric fields	Assignment#1 Ch 16 is due
			17.1	Potential Energy	
	Fri Jan 22	4	17.2	Potential	
			17.3	Field and Potential	
			17.4	Conservation of Energy; moving charges	
3 (Tut 1)	Wed Jan 27	5	17.4	Conservation of Energy; moving charges (cont.)	Assignment#2 Ch 16-17 is due
			17.5	Capacitors	
			17.6	Dielectrics	
			17.7	Energy in a Capacitor	
	Fri Jan 29	6	18.1	Current	Reading Quiz Chapter 18 is due
			18.2	EMF & Circuits	
			18.4	Resistance & Resistivity	
			18.5	Kirchhoff's Rules	
4 (Lab 2)	Wed Feb 3	7	18.6	Series and Parallel Circuits	Assignment#3 Ch 17 is due
			18.8	Power and Energy in Circuits	
			18.10	RC Circuits	
	Fri Feb 5	8	18.11	Electrical Safety	Reading Quiz Chapter 19 is due
			19.1	Magnetic Fields	
			19.2	Magnetic Force on a point charge	
			19.3	Charged particle moving perp to a uniform B field	
5 (Tut 2)	Wed Feb 10	9	19.4	Charged particle in a uniform magnetic field	Reading Quiz Chapter 20 is due
			19.5	Charged particle in crossed E and B fields	Assignment#4 Ch 18-19 is due
			19.8	Magnetic field due to an electric current	
			20.3	Faraday's Law	
			20.4	Lenz's Law	
	Fri Feb 12	10	20.4	Lenz's Law (continued)	Reading Quiz Chapter 21 is due
			20.9	Inductance	
			21.1	AC currents and voltages, with resistors	
Week of February 15-19 - Winter Study Break (No classes or tests)					

7(Lab 3)	Wed Feb 24	11	21.3	Capacitors in AC	Reading Quiz Chapter 22 is due
			21.4	Inductors in AC	Assignment#5 Ch 20-21 is due
			22.3	EM spectrum	
	Fri Feb 26	12	22.4	Speed of EM waves	
			22.5	Travelling EM waves in a vacuum	
			22.6	Intensity (part of section)	
22.7			Polarization		
8 (Tut 3)	Wed Mar 3	13	23.1	Wavefronts and Rays	Reading Quiz Chapter 23 is due
			23.2	Reflection	Assignment#6 Ch 22 is due
			23.3	Refraction	
	Fri Mar 5	14	23.4	Total Internal Reflection (TIR)	
			23.9	Thin lenses	
9 (Lab 4)	Wed Mar 10	15	23.9	Thin lenses (cont.)	Reading Quiz Chapter 24 is due
			24.1	Lenses in combination	Assignment#7 Ch 23 is due
			24.3	The Human Eye	
			24.4	Simple magnifier	
	Fri Mar 12	16	24.5	Compound microscopes (qualitative only)	Reading Quiz Chapter 25 is due
			25.1	Constructive and destructive interference	
			25.4	Young's Double Slit	
10 (Tut 4)	Wed Mar 17	17	25.5	Gratings	Reading Quiz Chapter 27 is due
			25.8	Resolution of optical instruments	
			27.2	Blackbody radiation	
	Fri Mar 19	18	27.3	Photoelectric effect	Assignment#8 Ch 25 is due
			27.6	Spectroscopy	
			27.7	Bohr model: atomic electron energy levels, transitions	
			27.7	Atomic Structure	
11 (Lab 5)	Wed Mar 24	19	27.7	Atomic Structure	Reading Quiz Chapter 28 is due
			28.1	Wave particle duality	
			28.2	Matter waves (de Broglie)	
			28.3	Electron microscope	
	Fri Mar 26	20	28.4	Uncertainty Principle	Assignment#9 Ch 27 is due
			28.5	Wave functions: confined particle	
			28.6	Hydrogen Atom	
			28.7	Exclusion Principle	
			28.9	Lasers	
12 (Tut 5)	Wed Mar 31	21	28.10	Tunneling	Reading Quiz Chapter 29 is due
			29.1	Nuclear structure	Assignment#10 Ch 28 is due
			29.2	Binding Energy	
			29.3	Radioactivity	
	Fri Apr 2	Statutory Holiday (University Closed)			
13 (Rev Tut)	Wed Apr 7	22	29.4	Decay rates and half life	Assignment#11 Ch29 is due
			29.5	Biological effects of ionizing radiation	
			29.7	Nuclear Fission	
			29.8	Nuclear Fusion	
	Fri Apr 9	23	30.1	Fundamental Particles	Reading Quiz Chapter 30 is due
			30.2	Fundamental Interactions	
			30.3	Beyond the Standard Model	
30.4			Particle Accelerators		
14	Wed Apr 14	24		Review	Assignment#12 Ch 30 is due

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 19, 2021**.

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 2020/2021 academic year:

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