

Physics II for the Life Sciences

PHYA22 - Winter 2023

Wednesday 10-12 AM HL B101

Friday 11-12 AM HLB101

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Office hours (tentatively) Wednesday 1 to 3 PM

Friday 1 to 2 PM

We are constantly surrounded by waves in the form of sounds and electromagnetic fields from various natural and man-made sources. The physics of electromagnetism is the basis of the emission of sunlight, a form of a traveling wave, and the forces holding the atoms and molecules together, providing fundamentals of the creation of life on earth. Moreover, our everyday life is heavily impacted by devices whose working principle obeys the laws of electromagnetism, such as cell phones, laptops, and TVs. In this course, we take an introductory leap into waves, electricity, and magnetism to understand the nature and principles of these phenomena. Then we further learn about the associated concepts in classical optics and nuclear physics.

By the end of this course, you will be familiar with the vocabulary used in the study of wave and electromagnetism. In addition, you will be able to employ mathematical tools for describing the laws of physics governing electricity and magnetism. Finally, we will study the application of these concepts with more emphasis on life and environmental sciences.

Course Requisites & Required Materials

Course Corequisite: Calculus II (MATA35/36/37)

Course Pre-requisites: Introduction to Physics IA (PHYA10/11), Calculus I (MATA 29/30/31)

Textbook

Fundamentals of Physics by Halliday, Resnick, & Walker (Wiley, 11th Ed.)

Your textbook is an excellent source for conceptual and detailed problems and will be the basis of online homework, practical activities, and quizzes. You need a registration code for **WileyPLUS** online services to access the homework. The access can be purchased bundled with the textbook or as digital-only resources. You can find the instruction for wileyplus registration on the course website.

Grading scheme

The distribution of the grade is as follows:

Component	%	Due Date
Online Homework	15	Ongoing (Bi-weekly)
Practical Activities	9	Ongoing (Weekly Practical)
Practical Quizzes	6	Pre-Practical
Lab Reports	6	Week 6 & 10
Test 1	10	Week 5 (Tentative)
Test 2	20	Week 9 (Tentative)
Final Exam	35	Exam Period (April 13 – April 27)

Online homework (15%)

The Bi-weekly assignments will be posted online through wileyplus with a one-week completion time. The assignments consist of problem sets based on the material taught in the lectures in the preceding weeks. There will be six assignments, and your final assignment grade is averaged over 5 of the best marks. **The assignment due dates can not be extended as the submission portal will be closed automatically.**

Practical Quizzes (6%)

Three quizzes (tri-weekly) will be conducted at the start of your practice session and finished by 30 minutes passed the session. Each quiz is worth 2 % toward your final grade. The quizzes are intended to encourage students to review the course material taught in the lectures and only cover the topics from the past three weeks of the quiz day.

Practical Sessions (15%)

In these three-hour sessions, you will work in a group on activities on the concepts introduced in the lectures and your textbook. These activities include problems and hands-on experiments to help you practice the concepts you learn during the lectures and develop your problem-solving skills. There will be qualified TAs present during the session leading the practicals and assisting you with the activities.

Two hands-on experiments will be conducted during the practicals tentatively in the week of 5 and 10 of the semester and require submitting a lab report. Each report is worth 3 % and will be written in collaboration with the entire group.

Attendance to the practicals is mandatory, and a reduced penalty equal to n^3 % of your final practical grade will be applied, where n is the number of absences (for example, four times of absence results in $4^3 = 64$ % of your total practical mark reduction).

Tests (30%)

There will be two tests tentatively on weeks 5 and 9 of the semesters, and the university will announce their exact date later during the term. Test 1 will be only 1 hour, contributes 10 % to your final grade, and has a format of only multiple-choice questions. Test 2 will be 2 hours long and has multiple choices and detailed problems. Both tests are cumulative as they include all the topics up to a week before the test. You are allowed to use a non-programmable calculator and a hand-written, double-sided, and letter-sized aid sheet for the tests. Photocopies or computer printouts are not allowed.

Final Examination (35%)

The final exam will be 3 hours long with multiple-choice questions and detailed problems. The exam date will be announced later during the semester and will be scheduled within the exam period of 13 April- 27 April. The final exam will include all the topics from the lectures, practicals, and assignments. You are allowed to use a calculator and an aid sheet similar to what you used for the tests.

- You can use any type of scientific and non-programmable calculator model during the practicals and exams/tests. A few models are listed below:
 - *Casio*: FX-260, FX-300*
 - *Texas Instruments*: TI-30X IIS, TI-30XS
 - *Sharp*: EL-520, EL-531, EL-W535

Lectures Schedule

The lectures start at 10:10 on Wednesdays and 11:10 on Fridays and end at noon. Attendance to the lectures is strongly recommended as the primary learning resource of the course is delivered through the lectures. Plus, the major course reminders and announcements will be during the lecture sessions, and attending the lectures is necessary to keep track of the course curriculum.

To take advantage of the lectures, you must come prepared and read the lecture's material beforehand. You are expected to be respectful to your classmates, which helps keep the class a pleasant learning environment. Any activities unrelated to the lectures, such as playing games or watching videos on your phones/laptops, are prohibited. Bringing any food or beverages is prohibited in the lectures or practicals room as they can distract your peers.

Course inquiries

For general inquiries, such as posting dates of assignments or due dates, you will most likely find the answers on the course discussion board. For example, another student may have asked your question, and someone else has already answered it. The discussion board will be checked regularly to ensure the popular questions are answered. If you can't find your answer, feel free to post your questions on the board.

In case you still need direct contact for a specific matter, please ensure you are using your UofT mail (with utoronto.ca address) and **include "PHYA22" at the start of your email subject**. And provide your full name in the message; otherwise, your reply to your message will be delayed. You should receive your response within two days.

Absences

To ensure fairness in the assessment of all students, there will be no makeup options for practical activities, formal reports, or tests. However, if a valid and documented problem supports an absence from a practical session, the grade will be calculated based on all other submitted work. If you were absent in your practicals, **you contact your TAs directly**, and they will guide you for any further action you may need to take for your absence declaration.

If a valid and documented problem supports an absence from the first test, the second test will increase its weight accordingly. Likewise, if a valid and documented problem supports an absence from the second test, the final Examination will increase its weight accordingly. If the problem is health-related, you must use the Verification Of Illness (VOI) form available on the Registrar's Website.

Showing up late will be recorded by TAs and will affect your practical marks for that session, and **showing up late more than 20 minutes past the class starting time will be counted as an absence**.

Academic Integrity and Respect for the Academic Endeavor

Academic integrity is essential to the pursuit of learning and scholarship in a university and ensuring that a degree from the University of Toronto is a strong signal of each student's academic achievement. As a result, the university treats cases of cheating and plagiarism very seriously. The University of Toronto's *Code of Behaviour on Academic Matters*:

<https://governingcouncil.utoronto.ca/media/15068/view>

Outlines the behaviors that constitute academic dishonesty and the processes for addressing academic offenses. Potential offenses include, but are not limited to:

- In papers and assignments: Using someone else's ideas or words without appropriate acknowledgment; submitting your work in more than one course without the permission of the instructor; making up sources or facts; obtaining or providing unauthorized assistance on any assignment; using someone else's clicker or multiple clickers for participation grades.

- On tests and exams: Using or possessing unauthorized aids; looking at someone else's answers during an exam or test; misrepresenting your identity.
- In academic work: Falsifying institutional documents or grades; falsifying or altering any documentation required by the university, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. However, suppose you have questions or concerns about what constitutes appropriate academic behavior or appropriate research and citation methods. In that case, you are expected to seek additional information on academic integrity from your instructor or other institutional resources (see <https://www.utoronto.ca/vpdean/academic-integrity>).

Class Schedule

The tentative lecture schedule is outlined below, but there might be a slight variation on the date and the content according to the students' performance.

Week #	Topics	Textbook Chapters
1- 9-13 January	Electric charge and field	21:1-3, 22:1-6
2- 16-20 January	Electric potential	24:1-7
3- 23-27 January	Capacitance	25:1,3-5
4- 30 January- 3 February	Current and resistance	26
5- 6-10 February	Circuits	27
6- 13-17 February	Magnetic field	28
Reading Week	-----	-----
7- 27 February- 3 March	Ray optics	33:5-6,34:1-3
8- 6-10 March	Lenses and optical instrument	34:3-5
9- 13-17 March	Interference and diffraction	35:1-4
10- 20-24 March	Photons and matter waves	38:1-5
11- 27-31 March	Atoms properties	40
12- 3-7 April	Nuclear physics	42

*This syllabus is based on Professor Dan weaver and Professor Johann Bayer's previously taught syllabi.