PHYS 326: Electricity and Magnetism
September 2023 - December 2023

Instructor: Prof. Michel Lefebvre
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Web: https://www.uvic.ca/science/physics/vispa/people/faculty/lefebvre.php
Office Hours: in Elliott 205A: Wednesdays at 14:00 - 15:15, starting 13 Sep 2023.
Course Webpage: Brightspace

This course is planned to be conducted face-to-face, in the classroom. All slides shown in class will be available on Brightspace. This course will be mathematically demanding; all students are assumed to have a strong basis in calculus and vector algebra.

Lectures: Tuesdays, Wednesdays and Fridays at 12:30 - 13:20, in Elliott 060
First lecture: Wednesday 6 September 2023
Tutorials: Wednesdays 08:30 - 09:20, starting 13 Sep 2023, in Cornett A121

Required courses
Prerequisites: all of PHYS 216, PHYS 248, MATH 204
Pre- or Co-requisites: one of PHYS 301, MATH 342, MATH 346

Required textbook
Introduction to Electrodynamics, 4th edition, David J. Griffiths.
Older editions also acceptable, but there are a few differences between the texts.

Course content
The end goal of this course is to provide all the necessary tools and methods for understanding the properties of electromagnetic fields using vector calculus, in particular electrostatics and magnetostatics. Maxwell's equations are then introduced. Content covers Griffiths chapters 1 to 7 and, if time allows, topics selected from chapters 8 and 9:

1. *Vector analysis*, including vector calculus.
2. *Electrostatics*, including the electric field, potential, and applications to conductors.
3. *Potentials*, including boundary value problems, multipoles.
4. *Electric fields in matter*, including polarization and dielectrics.
5. *Magnetostatics*, including Biot-Savart law, Ampere's law, vector potential, and displacement current.
6. *Magnetic fields in matter*, including magnetization, linear and non-linear media.
7. *Electrodynamics*, including electromotive force, induction, and Maxwell's equations.
8. Other topics, if time permits; may include conservation laws, wave propagation, energy transport.

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Learning outcomes

By the end of this course, students should

- have gained proficiency in the use of vector calculus in electromagnetism;
- know the principles of electrostatics that relate charge density, electric potential, and electric field;
- be able to use techniques in electrostatics — the method of images, separation of variables to solve Laplace equation, and multipole expansion;
- be able to use the concepts of polarization, bound charges, and electric displacement to solve simple electrostatic systems in matter, in particular in linear dielectrics;
- be familiar with the concept of work and energy in electrostatic systems;
- know the principles of magnetostatics that relate current density, the vector potential, and the magnetic field;
- be familiar with the concepts of magnetization, bound currents, and the auxiliary field H, and their application to simple magnetostatic systems in matter;
- know that a changing magnetic field induces an electric field;
- understand the experimental and theoretical origins of Maxwell's Equations;
- know that electromagnetic waves in vacuum are transverse waves and a consequence of Maxwell's Equations.

Midterm Exams

There will be two 50-minute midterm exams held in class during class time:

Midterm Exam 1:	Friday 20 October material from Chapters 1-2-3
Midterm Exam 2:	Friday 17 November material mainly from Chapters 4-5 (but also 1-2-3)

Note that the last day for withdrawing from first term courses without penalty of failure is Tuesday 31 October. See also the list of academic important dates.

Final Exam

There will a final exam during the December exam period. The date is centrally scheduled, and normally finalized in late October. **You must write the final exam to obtain credit for this course. You must exhibit adequate performance in the final exam to get credit for this course.**

Note on Exams

For the Midterm and Final exams you will be allowed to bring one page of notes, handwritten on both sides, and a calculator.

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Labs

Labs start the week of 11 September. **This first week of labs will contain introductory sessions, it is imperative that you attend. If you cannot attend, please contact your lab instructor.** All lab sections are normally held in Elliott 131. There will be no labs during the week of 13-17 Nov 2023.

To obtain credit for the course, you must complete all labs and receive an overall passing grade in the lab component. You will be given scheduling information at the first lab. The due date for any experiment report is normally in the lab period one week after the experiment has been completed. You may not undertake an experiment if you have not handed the experiment report for a previous exercise. No reports will be accepted after 4 Dec 2023.

Section B02, Wed 15:30 - 18:20, Elliott 131: Rob Rempel <drempel@uvic.ca>
Section B03, Mon 18:30 - 21:20, Elliott 131:
Jamal Mohammad Khani <mohammadkhanijamal@uvic.ca>
Please do not hesitate to contact your lab instructor if you have any issues with the labs.

Assignments

There will be approximatively 7 assignments throughout the semester. Some assignments may include a question that has a programming and graphing component. In this case, you will be expected to submit a printout of your code along with the results of the code. You may use any programming language (note that Excel is not a programming language).

Assignments will be administered through Brightspace, which means you will have to upload a pdf document clearly showing your work.

Assignment Policy:

- you are allowed (encouraged!) to collaborate on assignments, so long as your work and your solutions are your own;
- you are expected to treat your assignments with respect. Assignments that are disorganized or difficult to read will receive reduced marks at the marker's discretion;
- late assignments are not accepted.
- each assignment has a weight equal to its number of marks, typically between 20 and 35 marks each.

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Marking and Grades

Your final grade is obtained from the following marking scheme:

Assignments	20%	approximately 7 assignments
Labs	20%	must be passed
Midterm 1 exam	15%	Friday 20 October in class
Midterm 2 exam	15%	Friday 17 November in class
Final exam	30%	3-hour exam, December exam period

If the application of this scheme would result in grades that are judged by the instructor to be inconsistent with the University's grading descriptions, then the instructor will assign percentages consistent with them.

Notwithstanding the weighting and procedure explained above:
- If you do not write the final exam you will be assigned an "N";
- If you have not submitted all lab reports you will be assign an "N";
- If you exhibit inadequate performance on the labs you will be assign an "F";
- If you exhibit inadequate performance on the final exam you will be assign an "F";
- If you obtain less than 50% on each one of the three exams (both midterm exams and the final exam), you will be assigned an "F";
- A maximum course grade of 49% will be assigned to "N" and "F" grades.

Note that "N" and "F" grades are failing grades and factor into the GPA as a value of 0.

Accommodation

Arrangement for reasonable accommodations for customarily accommodated issues will be considered, however this is contingent on your active participation: If you miss a course requirement, you are expected to contact the instructor as soon as reasonably possible, and you are expected to give the instructor advance warning of issues that you could have reasonably foreseen. Familiarize yourself with UVic's academic concessions regulations and guidelines.

The University of Victoria is committed to creating a learning experience that is as accessible as possible. If you are registered with the Centre for Accessible Learning (CAL) and anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with the instructor. If you are a student with a disability or chronic health condition, you can meet with a CAL advisor to discuss access and accommodations.

Conduct

Attendance of live lectures is not required, **but strongly recommended**. In Physics, a discipline norm is that **mastery** combines very good comprehension with the ability to demonstrate that comprehension under time pressure, such as in a timed exam situation. Full engagement with course activities includes attending live lectures, submitting all lab reports, and submitting essentially all assignments.

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University Regulations on Academic Integrity
Students are required to abide by all academic regulations set as set out in the University calendar, including standards of academic integrity. Violations of academic integrity (e.g. cheating and plagiarism) are considered serious and may result in significant penalties.
Academic integrity requires commitment to the values of honesty, trust, fairness, respect, and responsibility. Any action that contravenes this standard, including misrepresentation, falsification or deception, undermines the intention and worth of scholarly work and violates the fundamental academic rights of members of our community.
Please familiarize yourself with the University Policy on Academic Integrity.

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