

COURSE SYLLABUS



COURSE TITLE: PHYS-210: Electricity and Magnetism

CLASS SECTION: X01A [Mechanical Engineering]

TERM: 2023F

COURSE CREDITS: 4

DELIVERY METHOD(S): Face to Face in Lecture and Laboratory

Camosun College campuses are located on the traditional territories of the Ləkʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.

Learn more about Camosun's [Territorial Acknowledgement](#).

INSTRUCTOR DETAILS

NAME: ED NELSON

EMAIL: nelson@camosun.ca

OFFICE: TECH 218 [250 370 4435 office] [250 884 6266 mobile for texts]

HOURS: T W Th F 12:30 – 1:30 or by appointment

As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.

CALENDAR DESCRIPTION

This is a calculus-based course in electricity and magnetism. Topics include electrostatics, including Coulomb's law and Gauss's law for uniform and non-uniform charge distributions; capacitance and dielectrics; electric circuits, including RC circuits; magnetic fields, including the Biot-Savart law and Ampere's law; electromagnetic induction and applications using Lenz's law; and LR circuits and Maxwell's equations.

PREREQUISITE(S):

Restricted to students in Engineering Bridge

All of:

- C in MATH 250B

CO-REQUISITE(S):

See Pre-requisites

EXCLUSION(S):

Not Applicable

COURSE LEARNING OUTCOMES / OBJECTIVES

Upon completion of this course students will be able to:

1. Provide and define the fundamental properties of the electric charge, solve technical problems associated with the electrostatic force (Coulomb force), the electric force field, Gauss's Law, the electric potential and potential difference, within a framework of distributed symmetric charge distributions, using calculus.
2. Define electric capacitance and solve technical problems associated with capacitors of various symmetries, capacitors in series and parallel combination, the microscopic effect of dielectric materials on capacitance and stored energy.
3. Define electric current, current density, and solve technical problems involving DC networks of resistors, batteries, and capacitors, Ohm's Law, Kirchhoff's Laws, and RC charging and decay circuits.
4. Define the magnetic field and magnetic flux, solve technical problems associated with the effect of static, non-uniform and uniform magnetic fields on moving charges and current-carrying wires, loops and the magnetic dipole.
5. Calculate the magnitude and direction of the magnetic field for symmetric current distributions using the Law of Biot-Savart and Ampere's Law, and state the limitations of Ampere's Law.
6. State Faraday's Law of Induction with Lenz's Law and use these equations to solve technical problems associated with induction.
7. Calculate inductance according to the fundamental definition, solve technical problems associated with LR circuits and coils, and calculate the stored energy in magnetic fields.
8. Quote the four Maxwell's equations, define all the terms, and demonstrate knowledge of the historical background leading to their development, with particular attention to the concept of the displacement current.
9. Observe record, organize and display data in tables, graphs or charts.
10. Analyze linear graphs (determine area, slope, intercept, etc.).
11. Observe and record sources of error and estimate/compute uncertainty in results.
12. Interpret meaning of experimental results in the context of the experimental objectives.
13. Write scientific reports in an acceptable, traditional format.

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

UNIVERSITY PHYSICS with Modern Physics, Hugh Young and Robert Freedman, Pearson, 14th or 15th edition [recommended]

PHYS 210 Lab Manual [available from Bookstore or online]

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

M 2:30 PM - 4:20 PM

2023/09/05 - 2023/12/09

Technologies, 222 Laboratory

M 10:30 AM - 11:20 AM

2023/09/05 - 2023/12/09

Technologies, 181 Lecture

T 3:30 PM - 4:20 PM

2023/09/05 - 2023/12/09

Technologies, 175 Lecture

Th 1:30 PM - 2:20 PM

2023/09/05 - 2023/12/09

Technologies, 181 Lecture

F 8:30 AM - 9:20 AM

2023/09/05 - 2023/12/09

Centre Business & Access, 213 Lecture

PHYSICS 210 - X01A 2023 Fall [MECH]

Lab* FORMAL REPORT – Lab 2, Lab 3, Lab 5 [In this section, Lab 1 Exercise presented in class]

Lab# SPECIAL HANDOUT (Not in Lab Manual) – Lab 2a, Lab 9

<i>Week</i>	<i>Lecture 1 Monday</i>	<i>Laboratory Monday</i>	<i>Lecture 2 Tuesday</i>	<i>Lecture 3 Thursday</i>	<i>Lecture 4 Friday</i>	<i>Textbook Chapters</i>
1 Sept 4 – 8	LABOUR DAY College Closed	LABOUR DAY College Closed	Introduction Math/Physics Review	Discuss Lab 1	Properties of Charges Coulomb's Law	21.1-21.3
2 Sept 11 – 15	Coulomb's Law with Point Charges	Lab 2 Electric Field Mapping 1*	Electric Field Electric Field Electric Forces	Electric Field of Distributed Charge	Tutorial 1 Math	21.3 – 21.5
3 Sept 18 – 22	Electric Field of Distributed Charge	Lab 2a Electric Field Mapping 2# (handout)	Electric Field Lines Electric Dipole	Electric Dipole Charge and Flux	Tutorial 2 E-Fields (Dist)	21.6 – 21.7
4 Sept 25 – 29	Electric Flux Gauss's Law	Lab Period CK Review	Gauss's Law Applications	Gauss's Law Applications Charges on Conductors	CK #1	22.1 – 22.5
5 Oct 2 – 6	National day for Truth and Reconciliation College Closed	National day for Truth and Reconciliation College Closed	Electric Potential V Point Charges	Electric Potential V Point Charges Lines, Spheres	Tutorial 3 Electric Flux	23.1 – 23.2
6 Oct 9 – 13	THANKSGIVING College Closed	THANKSGIVING College Closed	Electric Potential V Spheres Plates Cylinders	Equipotential Surfaces	Tutorial 4 Gauss's Law	23.2 – 23.4
7 Oct 16 – 20	Gradients in Equipotential Surfaces	Lab 3 Textbook Capacitor*	Capacitance Definition/Unit	Parallel Plate Spherical Cylindrical	Tutorial 5 Electric Potential	23.5 24.1
8 Oct 23 – 27	Series and Parallel Capacitors	Lab 5 Resistivity of Nichrome*	Energy Storage Dielectrics	Electric Current Resistivity Resistance	CK #2	24.2 – 24.4 25.1 – 25.3
9 Oct 30 – Nov 3	Ohm's Law Electric Power	Lab 6# RC Circuit Charge/Discharge Wire	Resistor Combinations	Resistor Combinations Kirchhoff Laws	Tutorial 6 Capacitors	26.1 – 26.4
10 Nov 6 – Nov 10	Midterm Review Kirchhoff Laws RC Circuit	Lab 7 Kirchhoff's Laws	RC Circuit Magnetic Fields Field Lines, Flux	Forces on Charges and Wires in Magnetic Fields	Tutorial 7 Capacitor Combo Resistivity	26.4 27.1 – 27.3 27.6 – 27.8
11 Nov 13 – 17	REMEMBRANCE DAY College Closed	REMEMBRANCE DAY College Closed	Biot-Savart Law Applications Elements, Wires	Force btwn Wires Mag Field Loop	Tutorial 8 Resistivity B force on Charges	28.2-28.3 28.4 – 28.7
12 Nov 20 – 24	Ampere's Law Wires, Solenoids	Lab 8 Magnetic Force on Wires	Magnetic Induction Faraday / Lenz	Motional EMF	CK #3	29.1 – 29.5
13 Nov 27 - Dec 1	Displacement Current	Lab 9# Magnetic Induction	Self-Inductance Magnetic Energy	LR Circuit	Tutorial 11 B field and Induction	29.7 30.2 – 30.4
14 Dec 4 – 8	Summary of Maxwell's Equations	Review	Review	Review	Review	32.1

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced notice is required. Deadlines can be reviewed on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Homework (weekly)	5
Tutorials	5
Celebrations of Knowledge (3, drop 1)	30
Laboratory Reports	20
Final Celebration of Knowledge	40
TOTAL	100%

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the [Grade Review and Appeals](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information. <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

COURSE GUIDELINES & EXPECTATIONS

- Course content, announcements, and important class information will be posted on D2L. Students must check D2L regularly.
- Homework will be assigned every week and will be submitted to D2L folders.
- Three (3) midterm tests will occur at the dates and times listed below. Out of the three midterm tests, the lowest midterm grade will be dropped for each student to make up the 30% weighting.
- The lab reports will be submitted to D2L folders. Lab reports are due ONE WEEK after the date of the lab exercise. Attendance and submission of Lab reports is mandatory and required to obtain credit in the course.

SCHOOL OR DEPARTMENTAL INFORMATION

PHYSICS DEPARTMENT GUIDELINES REGARDING TESTING AND GRADING:

- The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar, “students are expected to write tests and final exams at the scheduled time and place.” Exceptions will only be considered due to emergency circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.
- Students must write quizzes, tests, midterm tests, etc., on the date and time assigned by the instructor. Missed exams normally receive a zero grade. Instructors are not required to provide make-up tests. At their discretion, instructors may waive a test in exceptional circumstances such as

medical issues or a documented illness.

- Any outstanding homework or labs must be submitted prior to the last day of classes, and will be graded according to the late policy outlined by the instructor.
- Refer to your instructor’s information page for any additional policies regarding testing and grade calculation.

PHYSICS DEPARTMENT GUIDELINES REGARDING LABS:

- Students must obtain an overall grade of 50% or higher in the laboratory component of the course order to obtain credit for the course.
- Attendance is mandatory and you may be required to “sign in” at the beginning of each lab period. A lab may be waived or made up at a later time only in the case of documented illness or other extenuating circumstances. If you will be absent from a lab period due to illness it is your responsibility to notify your instructor.
- Unless otherwise stated by your instructor late penalties are as follows: For overdue labs (or assignments), a late penalty of 1 mark per day (10%) will be assessed for the first five days following the due date. After this date a complete report is still required and earns a maximum mark of 50%.
- At the discretion of the instructor, a student who is repeating this Physics course with a laboratory grade of 70% or higher may apply for lab exemption.
- Students will complete a minimum of 9 laboratory experiments including 3 formal reports (with full uncertainty calculations) and at least one lab using technology to perform data analysis.

STUDENT RESPONSIBILITY

Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

SUPPORTS AND SERVICES FOR STUDENTS

Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit <http://camosun.ca/students/>.

Academic Advising	http://camosun.ca/advising
Accessible Learning	http://camosun.ca/accessible-learning
Counselling	http://camosun.ca/counselling
Career Services	http://camosun.ca/coop

Financial Aid and Awards	http://camosun.ca/financialaid
Help Centres (Math/English/Science)	http://camosun.ca/help-centres
Indigenous Student Support	http://camosun.ca/indigenous
International Student Support	http://camosun.ca/international/
Learning Skills	http://camosun.ca/learningskills
Library	http://camosun.ca/services/library/
Office of Student Support	http://camosun.ca/oss
Ombudsperson	http://camosun.ca/ombuds
Registration	http://camosun.ca/registration
Technology Support	http://camosun.ca/its
Writing Centre	http://camosun.ca/writing-centre

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](#) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started:

<http://camosun.ca/services/accessible-learning/>

Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

Course Withdrawals Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the “Attendance” section under “Registration Policies and Procedures” (<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.

Sexual Violence and Misconduct

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun’s Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence or misconduct occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student’s right to choose what is right for them. For more information see Camosun’s Sexualized Violence and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and camosun.ca/sexual-violence. To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-3703841

Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College’s Student Misconduct Policy at

<http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

Changes to this syllabus: Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.