UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

COURSE OUTLINE

1. **Course:** PHYS 455, Electromagnetic Theory II - Fall 2020

   Lecture 01: MWF 13:00 - 13:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Jason Donev	jmdonev@ucalgary.ca	403 210-6343	SA 101A	Monday 14:00-15:00, Tuesday 10:00-11:00, Tuesday 13:00-14:00

   Online Delivery Details:

   This course is being offered online in real-time via scheduled meeting times, you are required to be online at the same time.

   Students will be meeting with the professor and working with other students over Zoom. While it will be possible to call in using a telephone, a computer with a microphone is encouraged to participate in the class discussions and group work.

   Course Site:

   D2L: PHYS 455 L01-(Fall 2020)-Electromagnetic Theory II

   Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

   See section 3.5.C in the Faculty of Science section of the online Calendar.

   Prerequisite(s):
   3 units from Physics 255, 355, 259 or 323; and Mathematics 375 or 376; and Mathematics 367 or 377.

   Antirequisite(s):
   Credit for Physics 455 and Electrical Engineering 475 will not be allowed.

3. **Grading:**

   The University policy on grading and related matters is described in F.1 and F.2 of the online University Calendar.

   In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Date
Midterm 1	15	Oct 9th
Midterm 2	15	Nov 6th
Final Exam	25	TBD
Homework	35	Ongoing
In class (worksheets+clicker questions)	10	Ongoing

   Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

   The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

   This course has a registrar scheduled final exam.

4. **Missed Components Of Term Work:**

   The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

   In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

5. **Scheduled Out-of-Class Activities:**

   There are no scheduled out of class activities for this course.

6. **Course Materials:**

   Required Textbook(s):

   > David J. Griffiths, *Introduction to Electrodynamics*: Addison Wesley.

   Recommended Textbook(s):

   > Schey, *DIV, Grad, Curl, and All That: An Informal Text on Vector Calculus*: Norton.
   > Fleisch, *A Student's Guide to Maxwell's Equations*: Cambridge.

   There will be videos reviewing math, doing examples and derivations posted for the students to learn from. Students are expected to watch these videos on their own time. This will be discussed in class.

   In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

   - A computer with a supported operating system, as well as the latest security, and malware updates;
   - A current and updated web browser;
   - Webcam/Camera (built-in or external);
   - Microphone and speaker (built-in or external), or headset with microphone;
   - Current antivirus and/or firewall software enabled;
   - Stable internet connection.

   For more information please refer to the UofC ELearning online website.

7. **Examination Policy:**

   Exams will be open book, open notes and open internet. However, students are not allowed to discuss the exam with other people while the exam is going on. The midterms will be handed out online and the exam will be due 24 hours later. The final exam will be scheduled by the registrar and will be 2 hours of content but students will have 3 hours to do the final exam to help with any internet connection issues.

   Students should also read the Calendar, Section G, on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

   There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

   For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section E.2 of the University Calendar.

10. **Human Studies Statement:**

    Students will not participate as subjects or researchers in human studies.

    See also Section E.5 of the University Calendar.

11. **Reappraisal Of Grades:**

    A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See Section I.3 of the University Calendar.

a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections I.1 and I.2 of the University Calendar

b. **Final Exam:** The student shall submit the request to Enrolment Services. See Section I.3 of the University Calendar.

12. **Other Important Information For Students:**

a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, Mental Health Services Website) and the Campus Mental Health Strategy website (Mental Health).

b. **SU Wellness Center:** For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.

c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at 403-220-2208. The complete University of Calgary policy on sexual violence can be viewed at (https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf)

d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples**.

e. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at procedure-for-accommodations-for-students-with-disabilities.pdf.

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics & Astronomy, Dr. David Feder by email phas.ahugrd@ucalgary.ca or phone 403-220-8127. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See Section E.4 of the University Calendar.

f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see Legal Services website.

g. **Student Union Information:** VP Academic, Phone: 403-220-3911 Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: 403-220-3913 Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: ombuds@ucalgary.ca.

h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction (USRI) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a

course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or non-academic misconduct, in addition to any other remedies available at law.

How we'll spend classroom time:

I believe in active learning and everyone participating in discussion; lectures will therefore follow the book closely and involve questions to keep students engaged. Education research-based questions will be asked in class during the lectures to help students understand the material better. Some of these questions will be delivered through a student response system (Top Hat) and some will be through worksheets which will be done in small groups on Zoom.

Bring:

- A calculator (using your phone or computer is just fine)
- A way of doing the worksheets (chat with me for options that will work for you!)
- Way of answering student response questions (clicker questions, like a cell phone, laptop or tablet)

If you fall behind or have trouble, please come to me and we can figure out what can be done about it. The earlier in the course you approach me the more help I can be.

Homework – Homework will be keeping up with the questions, largely from the book.

Assessments:

1. Homework Questions   Due: Once a week, most weeks

You will be assigned questions to do outside of class. Some of these questions will be written specifically for this class, and some will come from the textbook. You will write up these questions and turn them at the beginning of the class period.

Assessment Criteria: Turn them in, and then accuracy and clarity of work (if late they will be marked down 20%/day they are late unless discussed specifically with the instructor).

2. In-class activities   Due: Most class periods

You will be doing work on various problems in class (worksheets, clicker questions etc.) which will be assessed in real time or turned in at the end of class.

         Assessment Criteria: Completion.

3. Midterm Exams   Date: twice in term

Exams will cover material from the assignments and the book. The first exam will cover Chapters 1&2. The second exam will cover Chapters 3&4.

Assessment Criteria: Clear demonstration of work done, neatness and readability, and the correct answer. A correct answer with no work, or indecipherable work will not receive full credit. If you have special requirements for exams, please let me know as soon as possible.

4. Final Exam   Date: TBD by registrar

The final exam will cover Chapters 1-6 with a focus on 5&6.

Assessment Criteria: This exam will cover material from lecture, the assignments and the book. You'll be marked on material comprehension and how well you can communicate the material on the exams.

Topics that will be covered in class:

Vector Analysis

Vector Algebra: operations, component form, triple products

Differential Calculus: "del" operator, gradient, divergence, curl

Integral Calculus: line, surface, volume integrals

Curvilinear coordinates: spherical, cylindrical

Dirac delta function, vector fields

Electrostatics

Electric field, Coulomb's law, field lines, flux

Gauss's law, divergence, curl

Electric Potential, Poisson's equation, Laplace's equation

Work and energy: single charge, point charges, continuous distribution

Conductors: properties, induced charges, surface charge, capacitors

Special techniques

Laplace's equation: 1D, 2D, 3D, boundary conditions, uniqueness theorem

Method of images: classic, induced surface charge, force and energy

Separation of variables: Cartesian, spherical

Multipole expansion: monopole, dipole, potentials at large distances

Electric fields in matter

Polarization: dielectrics, induced dipoles, polar molecules

Polarized objects: bound charges, fields in dielectrics

Electric displacement D, Gauss's law, boundary conditions

Magnetostatics

Lorentz force law: magnetic fields, forces, currents

Biot-Savart law: steady currents, magnetic fields

Divergence and curl: currents, Ampere's law

Magnetic vector potential: boundary conditions, multipole expansion

Magnetic fields in matter

Magnetization: diamagnets, paramagnets, ferromagnets, magnetic dipoles

Magnetized objects: bound currents, fields inside matter

H field, Ampere's law in magnetized materials

Linear and nonlinear media, susceptibility and permeability

Course Learning Incomes
Students taking PHYS 455 are expected to have and effective working knowledge of vector calculus, differential equations and introductory electromagnetism.

Course Outcomes:

- Use Maxwell's equations for both electrostatics and magnetostatics
- Exploit the interrelationship between the electric and magnetic potentials and fields
- Articulate and employ the uniqueness theorems as they pertain to electrostatics
- Compare and contrast the behavior of electric and magnetic fields in matter and these fields in a vacuum
- Employ vector analysis to show how electric and magnetic fields are vector fields
- Model and analyze electrostatic and magnetostatic configurations using Cartesian, spherical and cylindrical coordinate systems
- Solve partial differential equations with the standard techniques for physics
- Express the boundary conditions relevant for electric and magnetic fields

Electronically Approved - Sep 01 2020 09:33

Department Approval