

PHYS 326 – Electricity and Magnetism
Course Outline: Sept 2017 – Dec 2017

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Lectures: 8:30 – 9:30 TWF, ELL 060
Tutorial: 12:30 – 1:30 W, ELL 162
Office Hours: I will post office hours on the PHYS 326 “CourseSpace” site.

Prerequisite: PHYS 216 and MATH 204.
Concurrent enrolment or prior completion of MATH 342.
This course will be mathematically demanding; I assume that all students have a strong basis in calculus and vector algebra.

Required Texts: “Introduction to Electrodynamics” Griffiths

Calendar Description:

Properties of electromagnetic fields using vector calculus, displacement current, Maxwell’s equations, plane electromagnetic waves with applications, transmission lines, and transients in LRC circuits.

Course Content:

Griffiths Chapters 1-7 and topics selected from Chapters 8 and 9.

1. Electrostatics: including electric field, potential, applications to conductors
2. Electrostatic solution techniques: including boundary value problems, multipoles
3. Electrostatics in matter: including dipoles, polarization, dielectrics
4. Magnetostatics: including Biot-Savart and Ampere’s law, vector potential, displacement current
5. Magnetic fields in matter: including magnetization, linear and non-linear media
6. Electrodynamics: Maxwell’s equations
7. Electromagnetic Waves: including transmission, reflection, refraction, Poynting vector.

Organizational Details:

Midterm Exams:

There will be an in-class midterm exam on **October 20**.

The midterm exam will be held in ECS 108. Note this is not the regular classroom.

Final Exam:

There will a final exam during the December exam period.

The date is centrally scheduled, and normally finalized in late October.

Do not plan December travel before you know the exam schedule.

You must write the final exam to get credit for this course.

Course Material:

I will distribute any course material via the “CourseSpaces” site for PHYS 326, available at coursespaces.uvic.ca.

This material will include assignments, some lecture notes, and similar material.

Assignments:

Assignments will be assigned and due approximately weekly.

Accommodations:

I am willing to arrange reasonable accommodations for customarily accommodated issues, however this is contingent on your active participation: If you miss a course requirement, I expect you to contact me as soon as reasonably possible, and I expect you to give me advance warning of issues that you could have reasonably foreseen.

Labs:

Lab sections are normally held in Elliott 131. Labs start September 11.

You must complete and pass all labs to obtain credit for the course.

No student will be granted exemption from the labs.

You will be given scheduling information at the first lab. You must choose a schedule of lab completion that has you undertaking at least one experiment prior to October 13, and at least two experiments prior to November 10.

The due date for any experiment report is normally in the lab period one week after the experiment has been completed. No reports will be accepted after December 4.

You may not undertake an experiment if you have not handed the experiment report for a previous exercise.

Summative Lab exercise:

Retain your data from the labs in electronic form. Near the end of the term you will be given an assignment that will require you to re-analyze your results from one experiment using information from class.

Marking and Grades:

The skills you must demonstrate in this course include

1. Calculation of the scalar potential and electric field for a static charge distribution in otherwise empty space.
2. Calculation of the vector potential and magnetic field for a current distribution in otherwise empty space.
3. Determination of the scalar potential, electric field, induced charge density, and similar quantities in the presence of conductors and free charges.
4. Expansion of potentials in terms of their multipole moments.
5. Calculation of the field of a polarized object, the induced polarization of an object in an electric field, and formulation of these problems in terms of bound charges.
6. Calculation of the field of a magnetized object, the induced magnetization of an object in a magnetic field, and formulation of these problems in terms of bound currents.
7. Application of Maxwell's equations to determine the electric field, magnetic field, or similar quantities in the case of time-varying charge and current configurations.
8. Application of Maxwell's equations to electromagnetic waves.
9. Other applications of the material taught in class and outlined in the text.

Examinable material includes everything discussed in class, in the assigned readings, and topics I think you should be able to deduce from those.

Grades will be assigned in accordance with the narrative descriptions in the undergraduate calendar, found here:

<http://web.uvic.ca/calendar2017-09/undergrad/info/regulations/grading.html#>

Exams:

- Students exhibit B-range performance by competently formulating all the posed problems mathematically and proceeding, using techniques from class, to attempt to solve the problem. Typical problems include mechanical calculation errors, omission of a relevant term, inappropriate approximations, and “getting lost” near the solution.
- Relative to B-range performance, A-range performance is characterized by only minor errors and a much more complete solution. In the event of an error at an early point in calculation A-range work drives through to a (wrong) solution. For an individual question A+ level work could be exhibited as the solution.
- Relative to B-range performance, C & D-range performance is characterized by significant mathematical deficiencies, and the inability to proceed past the formulation of the posed problems. This performance is also characterized by answering some questions at the B or A-range while omitting others.
- Inadequate performance (F-range) is characterized by the inability to formulate some of the posed problems, and superficial or mathematically deficient attempts at most of the remaining problems. Students who do not demonstrate acceptable mastery of skills #1 and #2 (listed above) on the final exam exhibit inadequate performance.

Problem sets:

- Students exhibit A- or B-range performance on problems sets by submitting substantially appropriate, legible, and correct solutions to all posed problems on all problem sets.
- Students exhibit C-, D-, or F-range performance on problem sets by failing to submit solutions to problems sets, by systematically failing to answer all questions on a problem set, by submitting illegible or hard-to-follow solutions, and by frequent late submission of their problem sets.

Labs:

- Students exhibit A- or B-range performance in the labs by completing the assigned task competently within the time allotted and producing an appropriate report. A-range work is characterized by fewer calculational problems and more detailed original insight.
- Students exhibit C- or D-range performance through work which has significant calculational or procedural flaws, which omits a small part of the required work, or which is submitted shortly after the deadline.
- Students exhibit inadequate (F-range) performance by failure to take appropriate care with the laboratory equipment, or by submitting a lab report significantly after the deadline.

Grading:

Midterm	20%
Labs & Lab exercise	20%
Assignments	20%
Final	40%

To determine your grade, I will combine my assessment of your performance in each of the assessed components subject to the weighting explained above to determine the appropriate grade category for you (A+ through F). Note that since grading categories are nominal data any averaging is, in principle, ill-defined, so in cases that are not clear, I will use my judgment to determine a reasonable grade. Once I have determined the appropriate category I will assign, as your percentage grade, a percentage that corresponds to that letter grade. I normally assign the same percentage to all students receiving the same letter grade.

Notwithstanding the weighting and procedure explained above:

- If you do not write the final exam I will assign an “N”.
- If you have not submitted all lab reports and the summative lab exercise I will assign an “N”.
- If you exhibit inadequate performance on the final exam I will assign an “F”.
- If you exhibit inadequate performance on the labs I will assign an “F”.