

PHYS*4180 Advanced Electromagnetic Theory

Fall 2017 Course Outline

Department of Physics
University of Guelph

Instructor Information

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Calendar Description

Radiation from localized charge-current distributions (atoms, molecules, nuclei, antennae), electromagnetic potentials, gauge transformations, Lagrangian and Hamiltonian formalisms, multipole expansions of electrostatic and magnetostatic fields, and a selection of topics from radiation damping. Lorentz electron theory, wave guides, plasmas, relativistic electrodynamics, radiation scattering.

Text

“Introduction to Electrodynamics” by D.J. Griffiths (4th Ed.), will be used as the primary text.

References

The book “Classical Electrodynamics” by J.D. Jackson covers rather more than what is in this course but it does describe all topics very clearly and is an excellent reference. Selected contents from the book “Modern Electrodynamics” by A. Zangwill will also be used as complementary material to the teaching.

Evaluation

Scheme 1

<u>Assessment</u>	<u>% of Grade</u>
Assignments	30%
Midterm Exam	30%
Final Exam	40%

Scheme 2

<u>Assessment</u>	<u>% of Grade</u>
Assignments	30%
Midterm Exam	20%
Final Exam	50%

Assignment deadlines will be enforced with a late penalty of 10% per day.

Midterm Examination

Friday, October 20th, 7:00 pm to 9:00 pm. Room TBA

Final Examination

Monday, December 11th, 7:00 pm to 9:00 pm. Room TBA

Lectures

Monday/Wednesday/Friday 9:30 am - 10:20 am in MacN 318

Outline

1. Electromagnetics (static \mathbf{E} , \mathbf{B} fields)
2. Multipole fields (spherical harmonic expansion)
3. Maxwell's eqn's. (time dependent \mathbf{E} , \mathbf{B} fields; Lagrangian and Hamiltonian for particle motion)
4. Waves (mostly special effects in conducting media; wave guides)
5. Retarded potentials and radiation from point charges
6. Radiation from harmonically oscillating charges
7. Scattering of EM radiation (dispersion in gases and liquids)
8. Special relativity and Maxwell's eqn's. (transformation properties of EM fields)

Consideration for Illness, etc.

If you request academic consideration due to illness of a physical, psychological or emotional nature, or due to compassionate reasons, you may be required to provide suitable documentation (e.g., a medical certificate from a physician) at the discretion of the lecturer. See the Undergraduate Calendar for details.

Getting Help

No fixed office hours set at this time, however, should it become necessary, I will inform you of these hours in class or via the course D2L site. You're encouraged to drop by my office anytime during the day to look for help or make an appointment to see me.

Collaboration versus Copying

Students are encouraged to discuss with each other during working on the problem assignments. However, the work that you submit as your assignment must not be a copy of someone else's work. Identical scripts will be given a mark of zero and plagiarism will be dealt with severely. Proper citations should be provided when books and other articles are used in your works.

Course Assessment

The Department of Physics requires student assessment of all courses taught by the Department. These assessments provide essential feedback to faculty on their teaching by identifying both strength and possible areas of improvement. In addition, annual student assessment of teaching provides part of the information used by the Department Tenure and Promotion Committee in evaluating the faculty member's contribution in the area of teaching. The Department's teaching evaluation questionnaire invites student response both through numerically quantifiable data, and written student comments. In conformity with University of Guelph Faculty Policy, the Department Tenure and Promotion Committee only considers comments signed by students (choosing "I agree" in question 14). Your instructor will see all signed and unsigned comments after final grades are submitted. Written student comments may also be used in support of a nomination for internal and external teaching awards.