

UNIVERSITY OF CALGARY
DEPARTMENT OF PHYSICS and ASTRONOMY
COURSE OUTLINE

1. **PHYSICS 457, Electromagnetic Theory III**

Lecture Sections:

L01: MWF, 13:00-13:50, SS 006 **Instructor,** Dr. E. Donovan

Office: SB 636 Phone: 220-6337 (no voicemail) e-mail: edonovan@ucalgary.ca, Office Hours: Friday 10:00-12:00
Blackboard: No

Physics and Astronomy office: SB 605, 403-220-5385

2. **PREREQUISITES:** Physics 455 and Applied Mathematics 413.

3. **GRADING:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

| | |
|-------------------------------|---|
| Assignment | 10% |
| 3 in class quizzes (15% each) | 45% |
| Final Examination | 45% (To be scheduled by the Registrar) |

Percentage grades will be given for all elements of term work and examinations. A weighted course percentage will be calculated for each student after the final exam is written. Conversion from final course percentage to final course letter grade will be as follows:

| Percentage Grade | Letter Grade |
|------------------|--------------|
| <45 | F |
| 45-49 | D |
| 50-53 | D+ |
| 54-57 | C- |
| 57-60 | C |
| 60-64 | C+ |
| 65-69 | B- |
| 70-74 | B |
| 74-79 | B+ |
| 80-84 | A- |
| 85-90 | A |
| 90-100 | A+ |

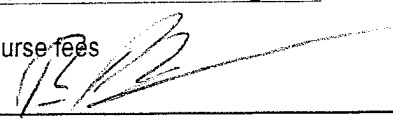
4. **Missed Components of Term Work.** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: <http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html>. It is the student's responsibility to familiarize himself/herself with these regulations. See also <http://www.ucalgary.ca/pubs/calendar/current/e-3.html>.

5. There is no planned out of class activity.

6. **TEXTBOOK:** "Introduction to Electrodynamics ", 3rd Edition. David Griffiths, Prentice-Hall 1999

7. **EXAMINATION POLICY:** Closed book, no calculator, formula sheet to be provided with exam. Students are encouraged to read the Calendar, Section G, on Examinations: <http://www.ucalgary.ca/pubs/calendar/current/g.html>.

8. There are no additional course fees

Department Approval  Date Jan 8 / 13

Associate Dean's Approval for out of regular class-time activity: _____ Date: _____

11. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

(a) **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 K. Student Misconduct (<http://www.ucalgary.ca/pubs/calendar/current/k.html>) to inform yourself of definitions, processes and penalties

- (b) **ASSEMBLY POINTS** in case of emergency during class time. Be sure to **FAMILIARIZE YOURSELF** with the information at <http://www.ucalgary.ca/emergencyplan/assemblypoints>.
- (c) **ACADEMIC ACCOMMODATION POLICY.** Students with documentable disabilities are referred to the following links:
Calendar entry on students with disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html>
Disability Resource Centre: <http://www.ucalgary.ca/drc/>
- (d) **SAFEWALK:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call **220-5333** for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **FREEDOM OF INFORMATION AND PRIVACY:** This course will be conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, **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 also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **STUDENT UNION INFORMATION:** VP Academic Phone: 220-3911 Email: suypaca@ucalgary.ca.
SU Faculty Rep. Phone: 220-3913 Email: sciencerep@su.ucalgary.ca Website <http://www.su.ucalgary.ca/home/contact.html>.
Student Ombudsman: <http://www.su.ucalgary.ca/services/student-services/student-rights.html>
- (i) **INTERNET and ELECTRONIC COMMUNICATION DEVICE Information.** You can assume that in all classes that you attend, **your cell phone should be turned off.** Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

DETAILED COURSE SYLLABUS

Electrodynamics

Electromotive force: Ohm's law, Joule heating, motional EMF

Electromagnetic induction: Faraday's law, Lenz's law, induced E-field, inductance, B-field energy

Maxwell's equations: displacement & polarization current, magnetic charge, boundary conditions

Conservation laws

Charge and energy: continuity equation, Poynting flux,

Momentum: Newton's 3rd law, Maxwell stress tensor, momentum flux density, angular momentum

Electromagnetic waves

One dimension: wave equation, sinusoids, reflection and transmission, polarization

Waves in vacuum: E&B wave equation, monochromatic plane waves, energy and momentum

Waves in matter: linear media, normal incidence reflection and transmission, oblique incidence, Snell's law, Fresnel equations, Brewster's angle

Absorption and dispersion: waves in conductors, reflection at conductors, group velocity, phase velocity, anomalous dispersion

Guided waves: wave guides, TE/TM, rectangular, cutoff frequency, coaxial transmission line, Potentials and Fields

Potential formulation: scalar and vector potentials, gauge transformations, Coulomb gauge, Lorentz gauge

Continuous distributions: retarded potentials, Jefimenko's equations

Point charges: Lienard-Weichert potentials, moving point charges

Radiation

Dipole radiation: electric dipole, magnetic dipole, arbitrary source

Point charges: radiated power, radiation reaction

Relativity

Special theory: Einstein's postulates, time dilation, Lorentz contraction, Lorentz transformations, four-vectors

Mechanics: proper time and velocity, energy and momentum, kinematics, dynamics

Electrodynamics: magnetism, field transformation, field tensor, potentials,