UNIVERSITY OF CALGARY
DEPARTMENT OF PHYSICS and ASTRONOMY
COURSE OUTLINE

1. **Physics 613, Electrodynamics**

   Lecture Sections:

   L01: TuTh, 11:00-12:15, SS 117

Instructor, D. Hobill Office SB 539
Tel. No., 403-220-6965
e-mail address, hobill@phas.ucalgary.ca
Office Hours: MW 13:30-15:30

Main PHAS Office SB605, telephone no., 403-220-5385

2. **PREREQUISITES:** Background should include Physics 457 amd Physics 501 or equivalent

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:

Assignments	40%	
Midterm test	20%	(Late Oct- Early Nov)
Final Examination	40%	(To be scheduled by the Registrar)

   The conversion from final course percentage to final course letter grade will be announced 4 weeks before the date of the final examination

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. **REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY**. If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. **TEXTBOOK:** ***Classical Electrodynamics,*** 3rd Edition, J.D. Jackson, (J. Wiley and Sons)

7. **EXAMINATION POLICY**: The examinations will take place in the computer labs (ST029) and all web resources my be used) Students are encouraged to read the Calendar, Section G, on Examinations: **http://www.ucalgary.ca/pubs/calendar/current/g.html**.

Department Approval _____ **Date** Sept 10/10

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

8. **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 **2205333** 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**: suvpaca@ucagary.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.

COURSE CONTENT

This course will taught from the point of view of a relativistically invariant classical field theory. Both the equations of motion for charged particles (the Lorentz force law) and the electromagnetic field equations (Maxwell's equations) will

be derived from a relativistic Lagrangianformulation. Special solutions to these equations (given specific boundary, initial and symmetry conditions) will then be analyzed. Topics to be coveredare:

1. Review of special relativity (Chap. 11)

   (a) Lorentz transformations

   (b) Four vectors and tensors

2. Particle motion in external fields (Chap. 12)

   (a) Lorentz force equation

   (b) Motion in different Electric and Magnetic field configurations

3. Maxwell's equations (Chap. 6)

   (a) Electromagnetic four-potential

   (b) Lagrangian densities

   (c) Electromagnetic field tensor

   (d) Electromagnetic energy-momentum tensor and conservation laws

4. Constant Electromagnetic fields (Chaps.1-3, 5)

   (a) Electrostatics

   (b) Multipole fields (time independent)

   (c) Magnetostatics

5. Electromagnetic waves (Chap.~7)

   (a) Gauge conditions

   (b) Plane Waves

   (c) Polarization

6. Fields of moving charges (Chaps.~14, 16)

   (a) Lienard-Wiechert potentials

   (b) Retarded potentials

   (c) Multipole fields (time dependent)

   (d) Radiation reaction

There will be one midterm (in-class) examination in late October or early November. The final examination will consist of a ``take-home'' set of problems as well as an in-class exam which will be completed during the scheduled final exam period.