PHYS 2401: calculus-based introductory physics II (Honors) – Fall 2009, SCI 118

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Labs:	Daniel BACKLUND		Science 132
	office hours	TBA	

PowerPoint notes (pdf) are at http://jupiter.phys.ttu.edu/stefanke/2401pdf

Schedule:	Tue + Thu	9:30 – 10:50	lecture
	Wed	2:00 – 4:50	lecture, recitation, homework, lab, mechanical universe, etc…

Course Materials:

- Text: Alonso and Finn: *Physics* (Addison-Wesley, 1996), because it was used in Hon-1408
  (if you already own a different Physics text, show me what you have before buying it)
- You will need the 2401 lab manual and a lab journal.

Course Description

This course covers the basic concepts of electricity and magnetism, as well as some optics. It is a calculus-based course, and there is also some vector analysis. There will be 6 physics labs which will aid in conceptual understanding of selected topics. The small size of this class allows a great deal of interaction between the instructor and the students. Take advantage of this.
The basic topics covered in the course will include:

- **Electric interaction:** charge and charge conservation, Coulomb's law, electric dipoles, electric field, electric potential, energy.
- **Magnetic interaction:** force on a charge in a magnetic field, magnetic field of a moving charge, magnetic dipoles.
- **Electric currents:** Ohm's law, conductivity, power, basic R circuits; magnetic interactions involving currents, forces between current.
- **Electric fields:** electromotive force, flux, Gauss' law, polarization, electric displacement, capacitors, energy
- **Magnetic fields:** Ampère's law, magnetic flux, magnetization, energy
- **The Electromagnetic field:** Faraday's law, induction, Maxwell's equations, EM waves
- **Basic optics:** reflection, refraction, lenses, etc.

Homeworks and tests

Homeworks: Problems will be assigned on a regular basis. The solutions will be discussed in detail during some of the Wednesday sessions. There are no homework grades, but the tests will include several homework problems. If you have done the homework and understood the solutions, this part of the tests will be easy. If you have not, you will run out of time on the tests…

Tests: Three tests are scheduled on Thursdays from 9:30 to 10:50, in class, on September 24, October 22, and November 19. They include general questions about your understanding of the lecture (abt. 1/3) and problems identical (or very similar) to homeworks and/or examples discussed in class (abt. 2/3). There are no make-up tests, but only the best two of your three test grades will count. If you are sick or out of town on a test day, this is the one I will drop.

Final: The final will be comprehensive. It is schedule for Friday December 11, from 7:30 to 10:00am. It will consist of general questions (abt. 1/3), multiple-choice questions (abt. 1/3) and original problems (abt. 1/3).

Labs: Six labs are scheduled for six Wednesday session. Keep detailed notes in your lab journals so that you are able to complete the formal lab write-up on your own at home. You will turn in your lab journal and a formal lab write-up in class, no later than on Tuesday morning following each lab. The report will contain the necessary explanations, discussion, calculations and error analysis. The lab grade on your report and journal entries will be based on both quantity and quality of the entry. Missing entries will be give zero points and entries deemed as partial or of sub-standard quality will not receive full credit.

Project: You will investigate in detail your favorite historical figure related to electricity and magnetism. Select someone like Maxwell, Faraday, Coulomb, Franklin, Volta, Hertz, etc. (see my historical introduction). You are I must agree on your topic by *Tuesday September 8*. Your report will contain the key events in your hero's life, some historical context, the key accomplishments (what was known and not known at the time, equations, explanations, context, etc.), their significance and consequences, references. Your report, less than 8 pages (single-sided and including title page, figures, and references) is due in class *no later than Tuesday December 1* (firm deadline). Please: no cut-n-paste from Wikipedia, Google, or such pre-digested summaries. Search your subject (use the web of course, but also books and biographies, data from the Institute of Physics web site, etc.). I want serious references: author, journal or book, publisher, year, page number. Avoid references to web sites or 2nd- or 3rd-hand sources. Write a real research paper, discover new things, and have fun doing it.

Grades

Two best test grades: 20% (each) Final: 30% Lab: 20% Project: 10%.

A: 100 – 86 B: 85 – 74 C: 73 – 64 D: 63 – 54 F: 53 – 0

Outcomes

So that the student will have:

Knowledge of basic processes, concepts and principles of the laws of governing electromagnetism;

Knowledge and understanding of the concepts and laboratory techniques found in university physics;

Knowledge of metric measures;

Proficiency in process skills, including identifying and controlling variables, interpreting data, formulating and teaching hypotheses and experimenting.

Course Objectives

Upon completion of this course, the student will be able to state the fundamental physical laws governing electricity and magnetism (especially Maxwell's equations) and basic optics;

Understand the fundamental concepts introduced during the lecture: fields, potentials, EM energy, etc.

Use calculus, vectors, and algebra in solving problems and deriving equations in this field;

Utilize basic problem solving processes, including observation, inference, measurement, prediction, use of numbers, classifying and use of space and time relationships;

Correctly use measuring devices and other equipment introduced in the lab;

Work effectively in group situations.

Any student who, because of a disabling condition, may require some special arrangements to meet the course requirements should contact the instructor as soon as possible so that necessary accommodations can be made. Proper documentation must be presented from the Student Disability Services (AcessTECH). For the complete description of this policy see Texas Tech Operating Policy 34.22 online.

Any student absent for a religious holiday should make the intention known prior to the absence and shall make up missed exams in accordance with Texas Tech Operating Policy 34.19

Students will foster a spirit of academic integrity, and they will not present work as their own that was not honestly performed by them. For a complete description of this policy see Texas Tech Operating Policy 34.12