PS 250 – Physics III for Engineers
Embry-Riddle University
Fall 2005

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Required text: *University Physics*, 11th edition, by Young & Freedman
Recommended: any calculus-based physics textbook, choose one you like
Recommended in the library: *Understanding Physics*, by Asimov
Cartoon Guide to Physics, by Gonick & Huffman
3000 Physics Problems

Grading:			*Grading scale*:		
	10%	homework		A	90 – 100 %
	60%	three exams (20% each)		B	75 – 90 %
	30%	two-hour final exam		C	60 – 75 %
				D	50 – 60 %

Homework: Assigned weekly, and due at the beginning of class. Graded for effort. Late homework will not be accepted.
Exams: Three exams. No make-ups. The final exam replaces the lowest exam score.
Final exam: Sat 10 Dec, 19:15 – 21:15. Two-hours. Comprehensive.

Holidays: Mon, 5 Sep (Labor Day)
Fri, 28 Oct (University Day)
Wed – Fri, 23-25 Nov (Thanksgiving)

IMPORTANT NOTE

Listening to lectures is not enough (*you retain only 10% of what you hear ...*). All processes of learning are somehow connected to active participation, and the learning of physics is no exception. Therefore, it is imperative that you work diligently at your own desk (*... 80% of what you practice ...*). However, this does not mean that you should only work alone. I encourage you to form study groups and collaborate with your classmates (*... and 90% of what you teach to others!*).

Course Description: Electric forces, electric field and Gauss's Law; Electric potential and electrostatic potential energy; Capacitance; Simple D-C circuit theory; Magnetic force, magnetic field and Ampere's Law; Faraday's Law; Inductance; Electromagnetic oscillations and wave propagation. **Prerequisites**: PS 160 and MA 242.

Goals: This course is designed primarily for students in the Aerospace Engineering, Electrical Engineering, Aviation Computer Science and Engineering Technology programs. It is the third of a three-course sequence of introductory classical physics, designed to provide the student with an appropriate background for more advanced physics and engineering course work. It is required that the students have a working knowledge of intermediate calculus.

Prerequisite Knowledge:

1. Differentiation and integration of scalar and vector functions of one or several variables
2. Vector analysis; scalar dot products & vector cross products
3. Series expansions of functions
4. Newtonian mechanics of particles and rigid bodies, including rigid-body rotation
5. Wave motion; description of traveling waves; wave superposition and interference; speed and intensity of waves
6. Sound waves: traveling and standing waves; beats; Doppler effect for sound

Learning Outcomes:

1. Describe the interaction of static electric charges utilizing the concept of electric field and compute the electric field produced by simple charge distributions by direct integration and by employing Gauss's Law.
2. Define electric potential, potential energy, and capacitance, and solve related problems.
3. Analyze the behavior of simple direct-current circuits, including resistance-capacitance arrangements.
4. Describe the interaction of moving electric charges utilizing the concept of magnetic field and compute the magnetic field produced by simple current distributions employing the Biot-Savart Law and Amperes' Law.
5. Describe the creation of electric fields from changing magnetic fields (Faraday's Law) and the creation of magnetic fields from changing electric fields (Amperes' Law with displacement current) and solve problems involving electromagnetic induction and motional EMF.
6. Define inductance and analyze the behavior of resistance-inductance and inductance-capacitance circuits.
7. Describe the interplay of oscillating electric and magnetic fields required for propagating electromagnetic waves.

Code of Behavior

In order for learning to take place, we all must act with civility (formal politeness) and respect (polite consideration, courtesy) toward each other. My responsibilities include coming to class prepared and on time, and evaluating you in a fair and impartial manner. Your responsibilities include coming to class prepared and on time, not disrupting the class (for example, talking without being called on, eating, reading newspapers, sleeping, shuffling papers, talking on cell phones, etc.), and treating your fellow students as colleagues (see the Student Handbook). Violations of this code can result in your removal from the class.

Academic Integrity

Issues of academic integrity are discussed on page 23 of the Student Handbook. They include plagiarism, cheating and fraud. Please read this section, and if you do not understand it, come see me. Some important passages are reproduced here:

"Sanctions [for academic dishonesty] may include failure of a test or assignment, failure of a course, suspension, or dismissal from the University."

"Plagiarism is recognized by the University as an act of academic dishonesty. It is defined as taking the ideas, writings, work, and/or words of another and representing them as one's own."

Office hours

I am always in my office during my office hours, and this is your time to speak with me about any aspect of the course. Also, I am generally in my office between 9 am and 5 pm, and available at times other than my office hours. However, I may be teaching or doing research, and not available immediately. If you need to speak with me, drop by or call me and set up an appointment.

Attendance

Class attendance is mandatory and I will take attendance. In addition, I will call on several of you each day to answer questions relating to the reading and the current material – not being present and prepared will affect your grade. If you miss a class for a legitimate reason you are still responsible for the material in lectures whether you are present or not. Make friends with your classmates, and know what has been discussed.

Reading

The textbook is your primary source of information – not lecture. If you don't like the assigned text, find one that you do like (they are all essentially equivalent) – check one out of the library or buy one from a used bookstore. Reading the text is mandatory and is to be done *before* each class. It is extremely important that you come to class prepared to think and discuss the day's topic. Not knowing that topic is a serious detriment to learning. The schedule is listed at the end of this syllabus. *How* to read the textbook is suggested below.

Notes

Taking notes during lecture is also important – but you must review and re-copy those notes after class (within a few hours). They should consist of highlighted notes and reworked problems. It is important that you get into the habit studying every day. Notes that are never reviewed are less than worthless: they give you a false sense of security.

General study habits

Repetition is critical for creating long-term memories. A good method for learning is the following sequence: read, listen, write, re-read, re-write, practice, and review. The textbook should be read THREE times: skim lightly once before class, read deeply (at least) once after class, and once as a review. In addition, you do not read textbooks as you would the newspaper. You must work through the examples, all mathematical steps should be confirmed, and you should write notes in the margins (it is your book, you can write in it!).

Homework

7-10 problems will be assigned from each chapter, and their solutions will be due at the beginning of the class period on the due date (late homework will not be accepted). These homework sets will be graded on effort. You will receive a score of 2 points if you reasonably attempt ALL of the problems, 1 point if you reasonably attempt SOME of the problems, and 0 points if you attempt none. By "reasonable," I mean that you must perform some calculations and not just rewrite the question.

These problem sets are **critical** to your success in this course. Not only are they worth 10% of your grade, but also the exam problems will be similar to the homework problems, and doing the homework well will boost your exam performance. I will post detailed solutions of the assigned problems on Blackboard. Solving the assigned problems is necessary (but not sufficient) to succeed in this course. I suggest that you read through the "Discussion Questions" and discuss them with your classmates (you may want to come back to them after you have done the calculation problems). Then solve as many of the simple, one-step numerical problems in the "Exercises" portion at the end of each chapter as you need for a full understanding. In addition, work as many of the "Problems" and "Challenge Problems" as you have time for.

In order to ensure that you receive maximum credit for your work on exams, here are some requirements that you should practice when writing up your solutions:

- Describe *briefly*, but in clear and complete sentences, the basic principles used to solve the problem and explain the basic equations that are used in the solution [DO NOT simply rewrite the question]. This is the most important component of a coherent solution.
- If a physical situation is discussed in the problem, draw an appropriate diagram.
- Identify in words, or by clear references to the diagram, all the symbols you use.
- Work through the problem symbolically, getting a simplified symbolic answer, and only substitute numbers (if appropriate at all) at the very end.
- If you obtain an explicit numerical solution, comment on whether the value you get is reasonable.
- Put boxes around your final answers.
- Write up the problem sets **neatly**.

Read the "Problem Solving Strategies" in the textbook. They are extremely helpful and suggest explicit techniques for attacking problems. Do not simply copy another student's work and don't copy from the solutions manual (see the statement about plagiarism above), but I recommend that you form study groups and work together. This can help you through difficult sections and problems.

Finally, homework must be neat, stapled, and have your name and section number clearly written. Unstapled homework will not be graded. Unreadable homework will not be graded.

Exams

Three in-class exams, and one two-hour final exam will be given. The in-class exams are closed book and closed notes. One 3"x5" card with your notes (on both sides) is allowed on the final exam. Programmable or graphing calculators are NOT allowed on any exam or exam (e.g., TI-80 and above). These rules will be strictly enforced.

An excellent method to prepare is to attempt problems at home in an exam-type environment. That is, once you have solved a group of problems, put aside the solutions and pretend that they are questions on an exam – attempt to solve them again, but without any help. If you can do this with several problems from each chapter, you should do fine on the exams.

Grading Criteria

From page 26 of the Student Handbook: "The following grades are used by the faculty to indicate the quality of work performed." (*I have added my own interpretations in italics.*)

A = Superior (*Performance of the student has been of the highest level, showing sustained excellence in meeting course responsibilities*)
B = Above Average (*Performance of the student has been good, though not of the highest level*)
C = Average (*Performance of the student has been adequate, satisfactorily meeting the course requirements*)
D = Below Average (*Performance of the student has been less than adequate*)
F = Failure (*Performance of the student has been such that course requirements have not been met.*)

Contrary to popular belief, you *are* in the "real world" now. Your success depends on you alone. You must be self-critical and determine the method by which you study best. Whatever method you use, I believe that success requires a ***minimum*** of **six (6)** hours per week **outside** of lecture. Come see me if you desire suggestions on time management, study hints, or anything that will help you succeed in this course.

You also need adequate sleep and exercise. If you don't get these, your body will not be able to function well (even though your mind is willing).

Lecture schedule		*Reading*
Week	**Topics**	**Chapters in Young**
1-4	Electric force, potential	21-23
5-8	Capacitors, DC circuits	24-26
9-12	Magnetic force, induction	27-30
13-14	Electromagnetics	32

Exam schedule (tentative)		
Exam	**Date**	**Chapters in Young**
1	Monday, Sep 26	21-23
2	Friday, Oct 21	24-26
3	Friday, Dec 2	27-30
Final	Saturday, Dec 10	21-30,32

Homework schedule

Solving the assigned problems below is necessary (but not sufficient) to succeed in this course. I suggest that you solve as many of the simple, one-step numerical problems in the "Exercises" portion at the end of each chapter as you need for a full understanding. In addition, work as many of the "Problems" as you have time for. The Difficult problems are NOT to be turned in, they are suggestions for those of you who desire a challenge.

Chapter 21
Due Fri Sep 9: 21.1, 21.9, 21.26, 21.30, 21.49, 21.57, 21.61, 21.94
Difficult problems: 21.80, 21.105

Chapter 22
Due Fri Sep 16: 22.1, 22.5, 22.9, 22.15, 22.21, 22.27, 22.44, 22.45
Difficult problems: 22.50, 22.59

Chapter 23
Due Fri Sep 23: 23.8, 23.9, 23.14, 23.22, 23.33, 23.40, 23.42, 23.50
Difficult problems: 23.44, 23.90