

PS 250 – Physics III for Engineers
Embry-Riddle University
Fall 2007

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Required text: *Principles of Physics*, 4th edition, by Serway & Jewett
Chapters 19-24, 27, 28-31
Supplementary: any calculus-based physics textbook, choose one you like
Understanding Physics, by Asimov
Cartoon Guide to Physics, by Gonick & Huffman

<i>Grading:</i>	10%	problem sets	<i>Grading scale:</i>	A	90 – 100 %
	66%	3 exams (22% each)		B	75 – 90 %
	24%	two-hour final exam		C	60 – 75 %
	~8%	<i>challenge work</i>		D	50 – 60 %

Problem Sets: Assigned weekly, and due at the beginning of class. Graded for correctness.
Late work will not be accepted.
Exams: 3 one-hour exams (Sep 21, Oct 17, Nov 16). No make-ups.
Final exam: Tue 11 Dec, 10:15 pm – 12:15 pm. Two-hours. Comprehensive.

Holidays: Mon, 3 Sep (Labor Day) Mon, 12 Oct (Veteran’s Day)
Fri, 9 Oct (University Day) Wed – Fri, 21-23 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 24 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 may not be available immediately. If you need to speak with me, drop by or call me and set up an appointment.

Attendance

Class attendance is strongly encouraged. If you miss a class you are still responsible for the material presented in lecture. 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 important – but you must review and re-copy those notes after class (within a few hours) for them to be useful. Notes that are never reviewed are less than worthless: they give you a false sense of security. It is important that you get into the habit studying every day.

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: read 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!).

Problem Sets

Several problems will be assigned every two or three class periods, and are due at the beginning of the class period on the due date. Each problem solution will be graded on a scale of 0 to 2 (0=not done, 1=attempted, 2=mostly correct). These problem sets are **critical** to your success in this course. Not only are they worth 10% of your grade, but also because the exam problems will be very similar to the homework problems, and solving the problems well will boost your exam performance. I suggest that you solve other problems as well, as practice for the exam, and most of the problems in the text are good for this.

In order to obtain full credit for each problem solution, you must solve it according to the following rules of coherence and readability:

- 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].
- 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.

Do not simply copy another student's work (see the statement about plagiarism above), and do not simply copy from the solutions manual, but I recommend that you form study groups and work together. This can help you through difficult sections and problems. I encourage you to discuss, argue, arm-wrestle, and finally master the problems. However, I expect you to write up your solutions individually, showing your own insights.

Finally, the problem set solutions must be neat, stapled, and have your name clearly written. Unstapled solutions will not be graded. Unreadable solutions will not be graded.

Exams

3 one-hour in-class exams, and one two-hour final exam will be given. All exams are closed book and closed notes. An excellent method to prepare for the exams 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.

Challenge Work

Two types of challenge work can be turned in for extra credit.

First, I will hand out a list of challenge problems. You may turn in one solution per week. These problems are more difficult than the problem sets in that they usually require a synthesis of many of the concepts and techniques that you have learned. Each correct challenge problem will count for 25% - 50% of one problem set.

Second, you can read one of the “Context” sections, write a short report on it, and solve all the associated problems. For example, the Context on global warming is sections 16.7, 17.11, 18.9, and the Conclusion (pages 597-600), and the associated problems are 16.40, 41; 17.54-56; 18.36, 37; 1-3 (page 599). Your report should be 1-2 pages, single spaced, minimum 500 words, and it should detail what you have learned from the Context, and how it relates to what you have learned in physics so far. This will be worth about 5%.

Deadline for Context choice:	November 1
Report due:	November 30

Grading System

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 in this course 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).

Preliminary schedule

Part 0. Gravitational review relevant to electrostatics

READING:

Gravitational field: 11.1-4

Chapter 11 – due Wed 8/29

04 05 11 22 24 25 48 53

Part 1. Electrostatics and Magnetostatics

READING:

Electric field: 19.1-5, 7 (and read 19.12, 21.1-4)

Electric potential: 20.1-6

Magnetic field I: 22.1, 7, 8, 11

Magnetic field II: 22. 2-6

Chapter 19 – due Wed 9/5

01 03 05 09 11 13 15
21 27 29

Chapter 20 – due Mon 9/10

01 03 05 09 11 13
21 23 25 27 29

Chapter 22 – I – due Fri 9/14

23 25 27 29 31 33 35
49

Chapter 22 – II – due Wed 9/19

01 03 05 07 09 11 13 15 17 19
21

Exam #1 – Fri 9/21