PS 215 – Physics I
Embry-Riddle University
Fall 2004

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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:
20% weekly homework
60% three one-hour exams (20% each)
20% two-hour final exam

Homework: Assigned weekly, and due at the beginning of class. Graded for correctness. Late homework will not be accepted. The lowest homework score will be dropped.
Exams: Three one-hour exams. No make-ups. The score on the final exam will replace the lowest score.
Final exam: Sat 11 Dec, 12:30 – 14:30. Two-hours. Comprehensive.

Holidays:
Mon, 6 Sep (Labor Day)
Fri, 5 Nov (University Day)
Wed – Fri, 24-26 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: Vector and scalar quantities. Newton's Laws of motion and gravitation. Friction. Work, energy, and power. Torque and rotational motion. Linear and angular momentum. **Corequisites:** MA 242, PS 216.

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

Prerequisite Knowledge:

1. Basic algebraic manipulations.
2. Exponential and logarithmic functions and related manipulation. Scientific notation.
3. Trigonometric functions and identities and applications.
4. Differential and integral calculus (Co-requisite).

Learning Outcomes:

1. Solve problems involving vectors in polar coordinates and rectangular coordinates using vector addition, subtraction, multiplication (dot and cross products), and including finding magnitudes of vectors and angles between vectors.
2. Analyze and solve problems in kinematics in one and two dimensions.
3. Restate Newton's Laws of Motion. Solve vector problems using Newton's Laws. In doing this, employ the knowledge of friction (static and kinetic) and uniform circular motion. Derive the expression for centripetal acceleration for uniform circular motion. Draw free-body diagrams.
4. Define work, kinetic energy and potential energy. Compute work for constant and variables forces. Demonstrate the use of the work-energy theorem and the conservation of energy. Define the concepts of linear momentum, impulse, center-of-mass (conservation of momentum), and demonstrate understanding by solving problems in one and two dimensions.
5. Recognize and apply the analog expressions for linear and rotational motions. Solve problems with constant and variable angular acceleration. Define and solve problems on torque, rotational inertia, angular momentum and the conservation of angular momentum.
6. Learn the conditions for static and dynamic equilibrium and apply to problems. Calculate the center of mass and use the concept to sole problems. Recognize the distinction between the center-of-mass and center-of-gravity.
7. Discuss and employ Hooke's Law, tensile stress, tensile strain and shear stress.

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, 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. Two common forms of plagiarism involve the use of written or oral work of another person without giving proper acknowledgment and the use of the oral work of another person as one's own."

> "Consider the example of a highly intelligent 7-year-old whom I wish to teach to play chess, although the child has no particular desire to learn but only a very strong desire for candy and little chance of obtaining it. I therefore tell the child that if the child will play chess with me once a week I will give the child 50 cents worth of candy ... and an extra 50 cents worth if the child wins ... The child then has every reason to cheat, provided he or she can do so successfully. But, so we hope, there will come a time when the child will find satisfaction in trying to excel in whatever way the game of chess demands. If the child still cheats, he or she will be defeating not me, but himself or herself."
>
> - Alasdair MacIntyre, *After Virtue*

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 although I will not take attendance. 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. Even though I will readily allow you to miss a class for a legitimate reason, you are still responsible for the material in lectures whether you are present or not.

Reading and Notes

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.

Taking notes during lecture is also important – but you must review those notes after class (within a few hours). Notes that are never reviewed are less than worthless: they give you a false sense of security.

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

Ten problems are assigned weekly, and are due at the beginning of the class period on the due date. Each problem will be graded on a scale of 0 to 5 – 5 points for correct, 2-4 points for correct ideas but missing pieces, 1 point for a weak attempt, 0 points for not seriously attempting. These problem sets are **critical** to your success in this course. Not only are they worth 20% of your grade, but also because the exam problems will be very similar to the homework problems, doing the homework well will boost your exam performance. I will post detailed solutions of the assigned problems on Blackboard. I suggest that you solve other problems as well, as practice for the exam, and my suggestions as to which extra problems to solve are listed with the assigned problems.

Two extra credit points are available for each homework problem (not the questions) if you solve the problem 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]. This is the most important component of coherence and no extra credit points will be given for any problem solution that does not contain such a description.
- 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 (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.

Exams

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

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. To help you, I have added ten extra problems from each chapter that can be used for this purpose. They are NOT to be turned in.

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 – including the percentage score to attain this level.*)

A = Superior (*Performance of the student has been of the highest level, showing sustained excellence in meeting course responsibilities – 90%*)
B = Above Average (*Performance of the student has been good, though not of the highest level – 75%*)
C = Average (*Performance of the student has been adequate, satisfactorily meeting the course requirements – 60%*)
D = Below Average (*Performance of the student has been less than adequate – 50%*)
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	Fundamentals (review)	1, App B, 4.1-4.3, 5.5
2, 3	Kinematics (one and two dimensions)	2, 3
4-6	Dynamics (Newton's laws & gravitation)	4, 5
7-9	Energy (work, potential energy)	6, 7
10	Momentum (collisions)	8
11-13	Rotational motion	9, 10

Exam schedule		
Exam	**Date**	**Chapters in Young**
1	Friday, Oct 1	1, 2, 3, 4
2	Friday, Oct 29	5, 6, 7
3	Friday, Dec 3	8, 9, 10
Final	Saturday, Dec 11	All

Homework schedule

Chapters 1 and 4
Due Wed Sep 8: Q1.3, Q1.8, Q1.10, 1.6, 1.12, 1.29, 1.60, Q4.6, Q4.7, Q4.9
Practice problems: 1.57, 1.64, 1.97, Q4.23, Q4.31, Q4.41; vectors: Q1.15, Q1.17, Q1.20, 1.33, 1.41, 1.48, 1.52, 1.73, 1.80, 1.88

Chapter 2
Due Wed Sep 15: Q2.1, Q2.11, Q2.19, 2.6, 2.10, 2.22, 2.38, 2.41, 2.58, 2.90
Practice problems: Q2.4, Q2.14, Q2.20, 2.5, 2.11, 2.17, 2.23, 2.74, 2.82, 2.91

Chapter 3
Due Wed Sep 22: Q3.1, Q3.9, Q3.13, 3.3, 3.12, 3.21, 3.29, 3.59, 3.79, 3.92
Practice problems: Q3.5, Q3.10, Q3.14, 3.7, 3.11, 3.16, 3.32, 3.37, 3.71, 3.89

Chapter 4
Due Wed Sep 29: Q4.8, Q4.26, Q4.34, 4.2, 4.14, 4.17, 4.23, 4.24, 4.46, 4.49
Practice problems: Q4.13, Q4.20, Q4.35, 4.4, 4.9, 4.16, 4.21, 4.30, 4.39, 4.52

Chapter 5
Due Wed Oct 13: Q5.7, Q5.10, Q5.28, 5.7, 5.19, 5.21, 5.46, 5.61, 5.114, 5.125
Practice problems: Q5.14, Q5.16, Q5.26, 5.13, 5.15, 5.28, 5.49, 5.86, 5.111, 5.121

Chapter 6
Due Wed Oct 20: Q6.1, Q6.10, Q6.16, 6.7, 6.13, 6.34, 6.46, 6.81, 6.93, 6.101
Practice problems: Q6.3, Q6.12, Q6.17, 6.4, 6.27, 6.42, 6.54, 6.68, 6.84, 6.102

Chapter 7
Due Wed Oct 27: Q7.1, Q7.5, Q7.16, 7.12, 7.23 (Ex 7.11), 7.31, 7.37, 7.41, 7.53, 7.87
Practice problems: Q7.6, Q7.10, Q7.12, 7.5, 7.19, 7.32, 7.33, 7.46, 7.68, 7.79

Chapter 8
Due Wed Nov 10: Q8.2, Q8.13, Q8.19, 8.10, 8.17, 8.28, 8.40, 8.63, 8.73, 8.101
Practice problems: Q8.3, Q8.9, Q8.22, 8.22, 8.34, 8.43, 8.45, 8.71, 8.89, 8.94

Chapter 9
Due Wed Nov 17: Q9.4, Q9.9, Q9.14, 9.2, 9.11, 9.22, 9.40, 9.52, 9.62, 9.92
Practice problems: Q9.8, Q9.10, Q9.17, 9.7, 9.18, 9.27, 9.43, 9.54, 9.63, 9.77

Chapter 10
Due Wed Dec 1: Q10.3, Q10.13, Q10.15, 10.2, 10.13, 10.22, 10.27, 10.38, 10.70, 10.73
Practice problems: Q10.4, Q10.9, Q10.21, 10.6, 10.18, 10.26, 10.36, 10.44, 10.63, 10.66