PS 103 – Technical Physics I
Embry-Riddle University
Spring 2005

Instructor: M. Anthony Reynolds
email: reynodb2@erau.edu
web: http://faculty.erau.edu/reynolds/ps103
(or ERAU online, Blackboard)
phone: (386) 226-7752
office: LB 313

office hours: 2:00–3:30 Mon–Fri (and by appointment)

Required text: *College Physics*, 5th edition, by Wilson & Buffa
Recommended: any algebra-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:	15%	homework	*Grading scale*:	A	90 – 100 %
	10%	quizzes		B	75 – 90 %
	60%	four exams (15% each)		C	60 – 75 %
	15%	two-hour final exam		D	50 – 60 %

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: Four exams. No make-ups. The final exam replaces the lowest exam.
Final exam: Sat 30 Apr, 17:00 – 19:00. Two-hours. Comprehensive.

Holidays: Mon, Jan 17 (Martin Luther King day)
Mon, Feb 21 (President's day)
Mon-Fri, Mar 21-25 (Spring break)

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: A course in elementary physics. Stress will be placed on basic physics principles. Problem solving and problem solving logic will be an important, integral part of this course. Topics will include Newton's Laws, projectile motion, circular motion, work, energy, conservation laws, and momentum. (Cannot be used for credit in physics toward degrees in Aerospace Engineering, Electrical Engineering, or Aircraft Engineering Technology.)
Prerequisite: MA 111 or MA 140. **Co-requisites**: MA 112 or MA 241, PS 103L.

Prerequisite Knowledge:
1. Solution of linear equations.
2. Solution of systems of equations.
3. Graphing techniques.
4. Exponents and roots.
5. Quadratic equation.
6. Ratio and proportion.
7. Elementary trigonometry.
8. Right triangle solutions.

Learning Outcomes:
1. Define physical units most frequently encountered in physics.
2. Use trigonometric relations, vectors and methods of vector addition in solving statics problems.
3. Describe the motion of an object in one dimension, including freely falling bodies with regard to various reference systems.
4. Calculate displacement, velocity and acceleration using the equations of motion.
5. Apply the equations of motion in two dimensions with emphasis on projectile motion.
6. Make calculations using the concept of inertia, force and acceleration of objects.
7. Apply Newton's laws of motion and draw free body diagrams to analyze objects in equilibrium and in non-equilibrium.
8. Calculate the speed, centripetal acceleration and forces acting on objects executing circular motion and apply it to motion of a satellite and artificial gravity.
9. Apply the concepts of work, kinetic energy and potential energy in solving problems.
10. Calculate work done by constant forces, kinetic energy of moving objects, gravitational potential energy of an object and power developed as work is done.
11. Apply the principle of conservation of energy to solve a variety of problems.
12. Quantitatively discuss the relationship between impulse applied and the corresponding change in momentum experienced by objects.
13. Apply the principle of conservation of linear momentum to solve problems of elastic and inelastic collisions.
14. Calculate angular displacement, angular velocity and angular acceleration using the rotational kinematic equations.
15. Apply Newton's law of rotation and describe the concepts of moment of inertia, and rotational work and energy as well as power.
16. Solve rotational kinematic and dynamic problems using the concept of torque.
17. Solve problems involving center of gravity locations and use the principle of conservation of angular momentum.

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."

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). I will periodically inspect your recopied notes at the beginning of class. 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

A problem set will be assigned from each chapter, and will be due at the beginning of the class period on the due date (late homework will not be accepted). Half of the problems (chosen randomly) 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 15% of your grade, but also because the exam problems will be very similar to the homework problems, and doing the homework well will boost your exam performance. I suggest that you solve other problems as well, as practice for the exam. Any of the odd problems in the textbook are good choices.

In order to ensure that you receive maximum credit for your work, here are some suggestions to follow 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 (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

Four 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 Wilson**
1-3	Introduction, Kinematics	1, 2
4-7	Vector motion, Newton's Laws of Motion	3, 4
8-11	Work, Energy, Momentum	5, 6
12-15	Rotational motion, Gravitation	7, 8

Exam schedule (tentative)		
Exam	**Date**	**Chapters in Wilson**
1	Friday, Jan 28	1, 2
2	Friday, Feb 25	3, 4
3	Wednesday, Mar 30	5, 6
4	Wednesday, Apr 27	7, 8
Final	Saturday, Apr 30	1-8

Preliminary Homework schedule

Chapter 1
Due Fri Jan 21: 1, 11, 23, 31, 43, 55, 69, 71, 83, 89

Chapter 2
Due Fri Jan 28: 1, 19, 31, 41, 47, 61, 71, 85, 97, 99

Chapter 3
Due Wed Feb 9: 1, 15, 21, 43, 53, 61, 67, 71, 75, 89, 97, 111