PS 226 – Physics I
Embry-Riddle University
Spring 2018

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Required text:	*Sears & Zemansky's University Physics*, 14th ed, by Young and Freedman
	Chapters 1-11, 13
	Volume I, ERAU edition, Chapters 1-12
Recommended:	*Physics*, by Tipler – QC 21.3 .T57
	Lectures on Physics, by Feynman – QC 23 .F47
	Understanding Physics, by Asimov – QC 23 .A85
	Cartoon Guide to Physics, by Gonick & Huffman – QC 24.5 .G66
"Hyperphysics"	http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
"Simple Nature"	http://lightandmatter.com/area1sn.html

Percentage system:

1 final exam	22.3%	
3 tests	66.6% (22.2% each)	
Quizzes	11.1%	

Grading scale:

A	90% –	
B	75% – 89%	
C	60% – 74%	
D	50% – 59%	

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. Kinematics, Newton's laws of motion, work and energy, conservation of energy, conservation of momentum and the center of mass and its motion. Rotational motion, conservation of angular momentum. Newton's law of gravitation, planetary orbits, Kepler's laws. **Prerequisite:** MA241.

Goals: This course is the first of a three-semester course sequence for students in engineering programs. It is a survey course in mechanics, designed to provide the student with an appropriate background for more advanced physics and engineering course work.

Prerequisite Knowledge:
1. Basic algebraic manipulations.
2. Algebra of Polynomials.
3. Exponential and logarithmic functions and related manipulation. Scientific notation.
4. Trigonometric functions and identities and applications.
5. Limits and the limit process.
6. Graphical analysis of functions.
7. Vector algebra.

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. Know the basic and fundamental units in the S.I. system and the English system. Be able to use dimensional analysis and be able to convert units. Be able to perform order of magnitude calculations.
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. Be able to solve problems using Newton's law of gravity.
6. Work problems in rotational kinematics and rotational dynamics. Be able to use energy methods in rotational motion.

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│                      RULES                          │
│  1. Arrive on time; depart on time.                 │
│  2. Take notes, and bring calculator to each class. │
│  3. No eating, no cell phones, no laptops.          │
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Final Exam

Comprehensive; two hours; closed book; closed notes.
Tools: 2 sharp pencils, eraser, scientific calculator, 3x5 card (both sides) for equations.
Date: Wednesday, 2 May, 08:00 am – 10:00 am.

Tests

50 minutes; closed book; closed notes.
Tools: 2 sharp pencils, eraser, scientific calculator.
Dates: Wed 7 Feb (Ch 1-3), Fri 23 Mar (Ch 4-8), Fri 20 Apr (Ch 9-11,13).
Final exam will replace lowest test score.

Homework

Worked examples in textbook
End-of-chapter problems in textbook

Quizzes

Take-home quizzes, in-class quizzes

All assignments are due at the *beginning* of class on the due date, after which they will be considered late and the score will be reduced by 50%. After the beginning of the *next* class period, they will not be accepted.

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!).

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.

Problem Solving

Solving problems is **critical** to your success in this course. 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. Solve problems according to the following rules of coherence and readability:

- Describe *briefly* the basic principles used to solve the problem and *justify* the basic equation(s) that are used in the solution [DO NOT 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.

Study Groups

Do not simply copy another student's work, 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.

"For most individuals, learning is most effectively carried out via social interactions."
- Ed Redish

| | | PS 226 | Sears/Zemansky 14e | Spring 2018 |
| | | | sections to read | |
	date	start	end	topic
Wed	10-Jan	intro		
Fri	12-Jan	1.1 - 1.5		units, how to solve, etc
Wed	17-Jan	1.6 - 1.10		vectors
Fri	19-Jan	2.1 - 2.3		position, velocity, acceleration
Mon	22-Jan	2.4		constant acceleration
Wed	24-Jan	2.5 - 2.6		free fall, integration
Fri	26-Jan	3.1 - 3.2		velocity, acceleration vectors
Mon	29-Jan	3.3		projectile motion
Wed	31-Jan	3.4 - 3.5		circular/relative motion
Fri	2-Feb			problems
Mon	5-Feb	review		
Wed	7-Feb	test #1		
Fri	9-Feb	4.1 - 4.3		Newton's Laws 1
Mon	12-Feb	4.4 - 4.6		Newton's Laws 2, force diagrams
Wed	14-Feb	5.1 - 5.2		N1 and N2
Fri	16-Feb	5.2 - 5.3		friction
Wed	21-Feb	5.3 - 5.4		circular dynamics
Fri	23-Feb	5.5 - 6.1		forces and work
Mon	26-Feb	6.2 - 6.3		work-kinetic energy
Wed	28-Feb	6.4 - 7.1		power/potential energy
Fri	2-Mar	7.2		elastic U
Mon	5-Mar	7.3 - 7.4		conservative forces
Wed	7-Mar	7.5 - 8.1		energy diagrams/impulse
Fri	9-Mar	8.2 - 8.3		momentum conservation
Mon	19-Mar	8.4 - 8.6		elastic collisions/c-o-m
Wed	21-Mar	review		
Fri	23-Mar	test #2		
Mon	26-Mar	9.1 - 9.3		angular kinematics
Wed	28-Mar	9.4 - 9.6		energy/moment of inertia
Fri	30-Mar	10.1 - 10.3		rotational dynamics/torque
Mon	2-Apr	10.3 - 10.5		work/power/angular momentum
Wed	4-Apr	10.6 - 11.2		L conservation/equilibrium
Fri	6-Apr	11.3 - 11.4		stress/strain
Mon	9-Apr	11.5 - 13.2		plasticity/gravitation
Wed	11-Apr	13.3 - 13.5		gravitational U/Kepler
Fri	13-Apr	13.5 - 13.8		rotation/black holes
Mon	16-Apr			dark matter
Wed	18-Apr	review		
Fri	20-Apr	test #3		
Mon	23-Apr	REVIEW		
Wed	25-Apr	REVIEW		
Wed	2-May	final exam		08:00-10:00