

Embry-Riddle Aeronautical University Prescott Campus

Course **PS150** **Physics I** **(Spring 2009)** **3 credit hours**

Instructor **Dr. Darrel Smith**

Office Hours See my website: <http://physicsx.pr.erau.edu/>

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Course Description

"Vector and scalar quantities; Geometrical Optics; Kinematics; Newton's Laws of motion. Friction. Work, energy and power. Conservation of energy. Conservation of momentum; the center of mass and its motion. Corequisite: MA241."

Goals

This course is an introductory course in college physics designed primarily for students in Aerospace Engineering, Electrical Engineering and Computer Science and as an elective for others requiring physics at this level. The fundamental aim of the course is that of providing a rigorous introduction to classical physics at a realistic level of conceptual and mathematical sophistication for students who are taking a beginning course in calculus. The emphasis is on developing an understanding of the basic principles. Problem solving is central to this course and practical applications are introduced where appropriate.

Textbook **University Physics** by Young & Freedman 12th edition © 2008
Publishers: Addison & Wesley

Required Materials **A scientific calculator.**

Attendance "Regular attendance and punctuality, in accordance with the published class schedule, are expected at all times in all courses." ***Don't miss class !!***

Course Outline

Chapter 1 Units, Physical Quantities and Vectors

Chapter 2 Motion Along a Straight Line

Chapter 3 Motion in Two or Three Dimensions

1st Exam (10%)

Chapter 4 Newton's Laws of Motion

Chapter 5 Applying Newton's Laws

Chapter 6 Work and Kinetic Energy

Chapter 7 Potential Energy and Energy Conservation

2nd Exam (15%)

Chapter 8 Momentum, Impulse, and Collisions

Chapter 9 Rotation of Rigid Bodies

Chapter 10 Dynamics of Rotational Motion

3rd Exam (20%)

Chapter 11 Equilibrium and Elasticity

April 23, 2009 Last Day of Classes

Homework (20%)

Homework is an essential part of this course. The homework problems at the end of each chapter are designed to develop and improve (1) your critical thinking skills, and (2) your ability to apply physics principles when solving physics problems.

1. **Exercises** – By answering *homework exercises*, you will become familiar with the concepts, important formulas, units and dimensions. These exercises are keyed to specific sections within the chapter; problems similar to these will be found in the three exams and the final. "Most" of the answers from this section are numerical, while only a few are symbolic.
2. **Problems** – These are traditional physics problems that explore the geometrical relationships between physical quantities. They are not keyed to any particular section, and often require the use of concepts from multiple sections or sometimes from previous chapters. Some problems call for the student to estimate or independently locate the data needed to solve the problem. By their very nature, homework problems usually take longer to solve compared to exercises. The answers to some of these problems are *symbolic* rather than *numerical*, or they involve the combination of two or more physical concepts. While problems similar to these may appear on the exams and final, many of them tend to be too lengthy, thus making them inappropriate for in-class exams. These problems provide a capstone activity for this course.

Homework Grading – Each homework assignment is worth 10 points. Five points will be awarded to homework papers where a reasonable effort has been made to solve the problems. One or more problems will be graded for an additional five points for a total of 10 points. Students are encouraged to expand their practical knowledge of physics and improve their problem-solving skills by working more than just the assigned problems.

Homework is due on the class day following the last lecture of a chapter, at the beginning of class. One point is taken off every day homework is late. **The homework assignments are posted at the end of the lecture notes for each chapter.**

Final Exam (35%) Comprehensive 8:00-10:00 AM Saturday April 25, 2009

Grading	Weight	
Homework	20%	A = 90 - 100%
Exams	3 exams = 45%	B = 80 - 90%
Final	35%	C = 70 - 80%
		D = 60 - 70%

The best way to prepare for the exams is to understand how to solve the homework problems. You are responsible for understanding the solutions to homework problems as well as the material presented in class.

Learning Outcomes (from the university syllabus):

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 difference between geometrical optics and physical optics. Be able to use and understand the usefulness of the ray method and draw ray diagrams using the three basic rays. Define the index of refraction and realize that it depends on wavelength. Be familiar with $v=f\lambda$. Know why waves refract and be able to apply Snell's law to solve problems.
- 3.* Be able to calculate image, object distances and focal lengths for concave and convex mirrors and thin lenses. Be able to use the lensmaker's equation in solving problems. Be able to analyze and solve systems with more than one lens, using ray diagrams and equations. Know how to apply this to instruments like the camera and telescope. Know that light intensity drops off as $1/r^2$ and the units for light intensity.
4. 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.
5. 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.
6. Define work, kinetic energy and potential energy. Compute work for constant and variable 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.

*Some of this material is covered in PS160, as well as the PS253 lab.

Disability Statement

ERAU is committed to the success of all students. It is a University policy to provide reasonable accommodations to students with disabilities. If you would like to request accommodations due to a physical, mental, or learning disability, please contact the Disability Services Coordinator at the Student Success Center, or call 777-3700. All discussions will remain confidential.