

PENSACOLA JR. COLLEGE

FALL, 2009

PHY 2048: PHYSICS 1 WITH CALCULUS

T, Thurs 10:00 A.M. - 11:50 A.M.

SECTION #: 1208

ROOM 1776

Instructor: Dr. Joseph M. Zayas Office Tel. #: 484-1104 PJC Office: 9728  
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TEXTBOOK: PHYSICS FOR SCIENTISTS AND ENGINEERS, 7<sup>th</sup> Edition.  
By R. A. Serway and J. Jewett  
Thomson, Brooks/Cole Publisher

#### CATALOG

DESCRIPTION: A physics course with emphasis on fundamental principles, the quantitative and mathematical aspects of the subject. For engineers and physics majors, optional for chemistry majors. Includes the study of mechanics and thermodynamics. A free use of calculus methods and derivations lay the foundation for basic principles. Meets general education category X or XI. Corequisites: MAC 2312 and PHY 2048L.

#### POLICY

STATEMENT: This course is intended for students in science and the various engineering disciplines. The basic intention is to provide a thorough introduction to the laws of physics through the use of the calculus, and to show the student how to properly analyze and reason out practical problems involving these laws. Upon successful completion of the course, the student should be able to derive formulas from basic principles and work out solutions to physical problems in the subfields of mechanics and thermodynamics.

#### PROBLEM

SOLVING: A physics course is very demanding of the student's time. Every week, a number of problems will be assigned by the instructor (see last page of this syllabus). It is extremely important that each student allocate enough time to thoroughly understand the material covered during the week and work out all the assigned problems. Students are strongly encouraged to work in groups. This technique usually leads to more material being covered with greater overall understanding. Homework problem assignments will be discussed in class but will not be graded.

#### SPECIAL

ATTENTION: Students requiring modifications because of documented disability should discuss this need with the Disabled Student Services office at the beginning of the semester.

FLEXIBILITY: The instructor intends to accomplish the objectives specified in this syllabus. However, special circumstances may arise that may require changes in syllabus content.

COURSE OBJECTIVES FOR PHY 2048:

Upon completion of the course, the student will be able to:

- 1) Describe the motion of objects moving at constant velocity or constant acceleration.
- 2) Find the magnitude and direction of the resultant vector obtained by adding several vectors.
- 3) Analyze the relative motion of two moving bodies.
- 4) Find the horizontal range of a projectile.
- 5) Write down Newton's three laws of motion.
- 6) Write down Newton's Law of Gravitation.
- 7) Describe the concept of inertia.
- 8) Indicate the relationship between the mass and weight of a body.
- 9) Identify action-reaction force pairs.
- 10) Explain the difference between static and kinetic friction.
- 11) Find the coefficient of static friction from the angle of repose.
- 12) Draw a complete free-body diagram for a typical mechanics problem.
- 13) Apply Newton's 2<sup>nd</sup> law and give a complete description of the motion of a block placed on an inclined plane.
- 14) Indicate the conditions for an applied force to be able to perform work.
- 15) State and know how to apply the work-energy theorem.
- 16) Compute the kinetic energy of a moving body.
- 17) Find the gravitational potential energy of a body near the surface of the Earth.
- 18) Find the mechanical energy of a simple system.
- 19) State and be able to apply the law of conservation of energy.

- 20) Compute the efficiency of a motor when the power output and input are known.
- 21) Find the elastic potential energy of a compressed spring.
- 22) Locate the center of mass of a rigid body.
- 23) Find the linear momentum of a moving body.
- 24) Write down the linear impulse-momentum principle.
- 25) State the law of conservation of linear momentum.
- 26) Analyze both elastic and inelastic collisions of bodies.
- 27) Understand the meaning of the coefficient of restitution.
- 28) Indicate how the thrust of a rocket may be computed.
- 29) Find the angular velocity of a body moving along a circular path.
- 30) Compute the centripetal force required to keep a body rotating in a circular path.
- 31) Understand the difference between tangential and centripetal acceleration.
- 32) Compare centrifugal and centripetal forces.
- 33) Find the correct angle of banking for a highway curve.
- 34) Write down Kepler's laws of planetary motion.
- 35) Find the required altitude for a communications satellite in a geosynchronous orbit.
- 36) Compute the rotational kinetic energy of a spinning disk.
- 37) Find the rotational kinetic energy of a spinning rigid body when the moment of inertia and angular velocity are given.
- 38) Calculate the applied torque on a body when the moment arm and applied force are given.

- 39) Explain the motion of a rapidly spinning figure skater in terms of angular momentum conservation.
- 40) Write down the law of conservation of angular momentum.
- 41) Understand the concept of radius of gyration.
- 42) Apply the principles of translational and rotational equilibrium to a rigid body.
- 43) Write down Hooke's Law of elasticity for a coil spring.
- 44) Use the reference circle model to explain simple harmonic motion for a vibrating mass at the end of a spring.
- 45) Indicate how a simple pendulum may be used to find the acceleration of gravity.
- 46) Explain the effects of thermal expansion on a straight rod.
- 47) Write down and be able to apply the ideal gas law.
- 48) Know how to compute the amount of heat exchanged for a system where phase changes may or may not occur.
- 49) List the three basic method by which heat energy may be transported.
- 50) State the first and second laws of thermodynamics.
- 51) Find the efficiency of a Carnot engine.
- 52) Compute the coefficient of performance of a refrigerator.

#### GLOBAL LEARNING OUTCOMES ASSESSMENT

This course is a general education course at PJC. Students will be evaluated on their ability to meet the GLO standards as set by the college. This evaluation will consist of a special question addressing the specific GLO goals in Exam # 2, given near mid-term.

#### PIRATE MAIL

PJC provides an institutional email account to all credit students. Pirate Mail is the official method of communication, and students must use Pirate Mail when communicating with the College. In cases where companion software is used for a particular class, emails may be exchanged between instructor and student using the companion software.

GRADING

POLICY: Throughout the term, 3 full-period exams will be given. These exams will consist of 3 problems similar to those given at the end of each chapter and covered in class. The student will be expected to show all steps in the solution of each problem, with all reasoning clearly indicated. A properly labeled free-body diagram should appear wherever applicable. Partial credit will be awarded in direct proportion to amount of correct work and reasoning indicated. A 2-hour final exam will also be administered at the end of the course.

Each student is allowed to bring a 4 ¼” X 11” **formula sheet** to any exam including the final exam. The idea is that this course is supposed to teach the student how to think analytically. Its main purpose is to make the student successful at solving problems, rather than just to promote the memorization of physical equations, etc.

The lowest grade out of the 3 full-period exams will be dropped.

Grade breakdown:

- |   |             |                |
|---|-------------|----------------|
| 1) Average of 2 best full-period exams: | 70%         | of final grade |
| 2) Final exam:                          | 30%         | of final grade |
| Total:                                  | <u>100%</u> |                |

APPROXIMATE DATES FOR EXAMINATIONS:

- |           |                    |   |
|-----------|--------------------|---|
| EXAM # 1: | September 24, 2009 |   |
| EXAM # 2: | October 22, 2009   | <b><u>Last Day To Withdraw With</u></b>   |
| EXAM # 3: | November 24, 2009  | <b><u>A Grade Of W: Nov. 10, 2009</u></b> |

FINAL EXAM: December 15, 2009; 9:00 A.M.

REFERENCES:

- 1) Physics  
By D. Halliday, R. Resnick and K. Krane.  
John Wiley & Sons, Inc.
- 2) University Physics  
By H. D. Young  
Addison-Wesley Publishing Company.
- 3) Physics  
By P. Tipler  
Worth Publishers, Inc.

PHY 2048 – PHYSICS 1 WITH CALCULUS  
HOMEWORK PROBLEM ASSIGNMENT

TEXT: Physics for Scientists & Engineers, 7<sup>th</sup> Edition. By Serway & Jewett. Thomson, Brooks/Cole.

CHAPTER	PAGES	PROBLEM ASSIGNMENT
1	14 – 18	2,6,9,14,21,26,29,35,38,40,45,47,53,59
2	46 – 52	1,5,11,12,13,16,21,23,27,32,38,39,46,49,51,57,59,60
3	65 – 70	1,4,6,9,11,14,15,19,22,26,27,31,35,40,42,49,51,57
4	92 – 99	1,3,5,6,9,14,15,17,19,21,25,26,29,31,36,41,42,45,47,52
5	128 – 136	1,3,6,9,14,16,17,20,25,26,28,31,33,34,36,39,40,42,43, 45,57,60,62,66
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7	189 – 194	1,5,6,9,10,13,15,18,22,27,30,31,33,37,39,41,43,44,46,51, 56,57
8	218 – 226	3,4,7,12,13,15,19,21,25,28,32,35,39,42,43,50,53,55,57, 59,62
9	260 – 268	2,4,7,9,11,15,16,19,20,26,27,28,31,34,35,36,41,43,45,51, 53,55,57,62,67
10	299 – 310	1,3,5,8,10,13,17,19,21,23,26,27,28,32,33,34,37,44,45,49 51,58,61,65,71,72,74,77,78,79,83,85
11	330 – 336	3,6,11,14,17,23,24,25,29,32,33,35,37,39,42,43,49,50,51, 53,56
12	353 – 361	1,3,7,9,13,14,15,16,19,21,23,26,29,33,37,40,41,43,45,47, 48,51,52,55,59
13	382 – 388	2,3,5,10,14,15,17,21,22,25,26,30,32,35,39,41,44,52,56, 57,58
14	408– 416	3,4,5,7,12,15,17,21,23,27,28,31,33,35,36,39,39,45,46,47, 49,51,54,60,61,63,69
15	441 – 448	1,3,5,6,10,11,15,16,18,22,24,25,27,29,31,35,37,39,41,42, 47,49,55,56,59,67,69
19	546 – 552	1,3,5,7,10,13,17,18,21,25,28,31,33,38,39,41,47,54,56
20	580 – 586	2,3,7,9,11,14,15,17,21,23,26,28,30,31,35,37,39,42,45,49, 52,57,59,62
21	606 – 611	2,3,7,9,11,14,15,21,24,25,29,31,32,33,42,43,46,50,51,53, 55,59,61
22	635 – 640	1,3,4,7,8,11,14,16,20,21,23,26,27,29,31,33,37,39,41,43, 45,50,53,54,59,61,62

