

Introduction to Physics

Physics 109

Fall Semester, 2007

Meets at 11 AM, Tu. Wed. Thu.

Tuesdays—127 Cramer

Wed. & Thu.

115 Workman Center

Instructor: Loren Jacobson

Course Objective and Approach

- To give students a basic exposure to Physics that will better prepare them for more rigorous courses that will be taken later on.
- A classroom period, followed by two laboratory periods.
 - Classroom session, introduction to experiment, then students working problems singly and in teams.
 - First lab period, informal, get acquainted with the apparatus and the lab objective.
 - Second lab period, complete the experimental work, and start calculations.

Textbook

- **Physics for Scientists and Engineers**, Third Edition, by Richard Wolfson and Jay M. Pasachoff, Published by Addison Wesley, 1999. ISBN 0-0321-3571-2

Information on line:

- Chapter reading assignments and problems for the term.
- Laboratory Experiments for each week of the term.
 - A detailed lab manual has been prepared in order to guide your lab experiments.
 - We are using the lab room normally used by the Physics 121 lab. Our sessions will use the same experimental setups.
- Outline for a lab report
- Copies of classperiod slides?

Information on line (cont.)

- A detailed calendar with due dates for assignments and lab reports
- Location:
<http://infohost.nmt.edu/~ljacobso/physics109.html>

My Particulars:

- Retired from U. S. Air Force active duty in 1982
- Retired from Los Alamos National Laboratory in 2003
- Ph.D. in Metallurgy from U.C. Berkeley in 1968
- Taught at NM Tech Spring 2000 on sabbatical from Los Alamos
- Taught this course last semester, Spring 2007
- Office: 343 Workman Formal hours: Tu. 2-5 PM.
 - (Informal hours: before or after class, except Thursday)
 - Phone; 505-670-5728
 - E-mail: jacobsonla@att.net

Class Assessment

- We will give the “Force Concept Inventory” at the beginning of the course.
- We will also give this Inventory at the end of the course.
- Results will be used to assess the effectiveness of the course. (Will NOT affect your grade!)

Grading

- Grades will be based on the following:
 - Class participation 20%
 - Laboratory reports 20%
 - Homework 20%
 - Quizzes 20%
 - Final Exam 20%
- It may be necessary to adjust these percentages—you will be informed if so.
- Last semester— a grade of C or above in this course carried with it credit for Physics 121 Lab, meaning that when 121 is taken, lab need not be taken. This is expected to continue.

Class Period Methodology

- After brief introduction, problems will be posed, with multiple choice answers.
- Students will give independent answers using letter cards.
- Then, teams will be formed to work out a team answer.
- Comparison of results will help determine effectiveness of team approach.
- Last time-50% and 65%.

Doing Physics

- What is Physics?
 - Physics is the science that tells us how and why things work.
- Why study Physics?
 - No matter what your field of study, Physics is at the foundation of all.

Fields of Physics

- Mechanics
 - Governs motion
 - Emphasis, Classical Mechanics
- Thermodynamics
 - Heat, and its interactions with matter
- Electromagnetism
 - Optics

Measurements

- Length – Meter
- Time – Second
- Mass – Kilogram
- Other SI Units:
 - Ampere – electric current
 - Kelvin -- temperature
 - Mole – amount of a substance
 - Candela -- luminosity

Dimensional Analysis

- Distance = Speed x Time
 - $L = (L/T) \times T = L$
- Energy = Mass x Speed²
 - $E = M \times (L/T)^2$
- Always check equations to make sure that the dimensions are correct.

Accuracy and Significant Figures

- Radius of Earth – 6.37×10^6 m.
 - This value has three significant figures
- Multiplying or Dividing
 - Result should have the same number of significant figures as the least accurate number
- Adding or Subtracting
 - Number of digits to right of decimal point should equal the term with the smallest number of digits to the right of the decimal point.

A Significant Figures Problem

- A 3.6 cm long antenna is added to the front of an aircraft that is 41 m long. What is the overall length?
 - A. 41.036 m
 - B. 41.04 m
 - C. 41 m
 - D. 41.36 m

A Dimensional Analysis Problem

- An equation that will be encountered later is $x = \frac{1}{2} a t^2$. What are the dimensions of a?
 - A. LT
 - B. L/T
 - C. T/L
 - D. L/T²
 - E. T/L²

A Changing Units Problem

- I have enough postage for a 1oz. Letter, but only a metric scale. What is the maximum weight for my letter, in grams?
 - A. 16.3 g
 - B. 28.4 g
 - C. 30.5 g
 - D. 24.8 g
- (1 lb = 16 oz, 1 lb = 454 g)

Car Problem

- A car rounds a curve at constant speed.
- Is there a force on the car?
 - A. No, its speed is constant.
 - B. Yes
 - C. It depends on the sharpness of the curve.
 - D. It depends on the speed of the car.

A locomotive pulls a series of wagons. What is the correct analysis of the situation?

- A. The train moves forward because the locomotive pulls forward slightly harder on the wagons than the wagons pull backward on the locomotive.
- B. Because action equals reaction, the locomotive cannot pull the wagons—the wagons pull backward just as hard as the locomotive pulls forward.
- C. The locomotive gets the wagons to move by giving them a big tug which momentarily overcomes the backward pull of the wagons.
- D. The locomotive force on the wagons is equal to the force of the wagons on the locomotive, but the frictional force on the locomotive is forward and large, while the backward friction on the wagons is small.
- E. The locomotive pulls the wagons forward only if it weighs more than the wagons.

Next Period (Wednesday, 22 August, in 115 Workman)

- The Force Concept Inventory will be given
- Introduction to Laboratory and procedures