Syllabus PHYS 213 section 5

Fall 2011

General information

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Office hours: Every business day, 3 pm – 4 pm or by appointment.

Office: 5 Kennon observatory; Phone: 662.915.7849

Lecture: Tuesday, Thursday 9:30 – 10:45 am in 101 Lewis Hall

Text: D. C. Giancoli, *Physics: Principles with Applications,* 6th ed., Pearson, 2005,

including Mastering Physics student access kit. ISBN 0-13-060620-0

Description

This is the first part of a two-course sequence on general physics for pre-med majors. The students must also take, unless previously passed, the laboratory course PHYS 223.
The main topics discussed in PHYS 213 are kinematics and dynamics, work, energy, linear and angular momenta, equilibrium, basic physics of fluids, vibrations and waves, sound, temperature, and heat.
The students are expected to have working knowledge of algebra and trigonometry, i.e. be able to solve linear, quadratic, and trigonometric equations and systems of linear equations that consist of symbols. After a symbolic solution is obtained **without** using a calculator, a student should be able to substitute the numbers into this algebraic solution to obtain the numerical answer.

Learning goals

Upon successful completion of this course, a student should:

- gain understanding of the physics concepts discussed in the course and be able to express this knowledge using correct physics terms.
- develop and improve problem solving skills, including logical reasoning, ability to apply the correct concept, ability to correctly solve a set of equations for designated unknowns.

Evaluation

Homework will be assigned every Wednesday and is due the following Wednesday. The goal of the homework is to prepare students for the tests. A homework solution example is attached to the syllabus. All steps of the solution described in the example are required for full credit. A correct answer alone will be given only a small portion of the credit.

Tests Two **closed book** tests will be given. Tentative schedule: Test 1 (chapters 1 through 4) – September 13; Test 2 (chapters 5 through 9) – October 20.

Final exam is **closed book, comprehensive**.

It will take place on Wednesday, December 8, at 8 am, in 101 Lewis Hall.

Grading

The grades will be posted on Blackboard. The students are responsible for verifying their grades and notifying their TA, grader, and professor if a mistake occurs.

The assignments will contribute to the final grade as follows:

Attendance (less than 3 classed missed) **– 10%**
Homework assignments - 35%
Test 1 – 15%
Test 2 – 15%
Final exam – 25%

Letter grades: 90-100 is an **A**, 80-89 is a **B**, 70-79 is a **C**, 60-69 is a **D**, below 60 is an **F**.

Policies

A student who missed more than 2 classes during the semester will lose the 10% attendance credit. This includes illness, business trips, external exams, and university activities. Please plan your time accordingly. A student who came late or left earlier is considered absent for the day.

Any missed test, or homework assignment will be given a **zero** grade. Late homeworks will **not** be accepted.

Make-up **tests** are possible in three cases: 1) a documented illness, 2) participation in an official university activity, 3) a family emergency. A written statement from a doctor, a team coach, or another official that justifies the absence is required for the make-up. The make-up

test will be generally harder than the initial test.

The final exam cannot be re-scheduled. There will be no make-up for the final exam.

Academic integrity: Discussion of the topics learned in class, methods for solving test and homework problems **is encouraged**. However, **the homework assignment must be done individually**. Identical homework assignments and their parts will be given a **zero** grade.

Tentative schedule

Dates	Chapter	Topic
8/23-8/25	1	Measurement
8/25-8/30	2	Motion
9/1-9/6	3	Kinematics
9/6-9/8	4	Dynamics
9/13-9/15	5	Circular motion
September 13		**Test 1**
9/20-9/22	6	Work and Energy
9/27-9/29	7	Linear Momentum
10/4-10/6	8	Rotational Motion
10/11-10/13	9	Equilibrium
10/13-10/25	10	Fluids
October 20		**Test 2**
10/27-11/3	11	Waves
11/8-11/10	12	Sound
11/15-11/29	13	Temperature
12/1	14	Heat
December 1		**Review session**

Resources

Do read the textbook before attempting the homework.

Do read the textbook again before the test.

Please **ask questions**. The more questions you ask, the better you understand the material, the higher your grade will be.

Free tutoring is provided in 104 Lewis Hall. Please check the schedule on the door.

Use professor's office hours to ask questions as well.

The test problem solutions will be presented after each test.

How to solve homework problems

1. Read the problem carefully. Pay attention to all details.
2. List all **known** values and their units.
3. List all **unknown** values and their units.
4. Read the problem again and **make a sketch** of the situation described in it. **Always start with a coordinate system.** Draw symbols for all known and unknown values on the sketch.
5. In the book, **find** the physics concepts or the laws of physics that will be used in the solution. **Write down the concepts** (laws) **that will be used** to solve the problem.
6. **Write down the formula** or equation that represents each concept. You must have as many equations as there are unknowns.
7. Solve the equations using algebra. Obtain the answer in a symbolic form. **Do not use a calculator at this stage.**
8. Substitute the numbers in the symbolic solution. Obtain the answer in a numeric form. **Verify the units.**

Homework partial credit rules:

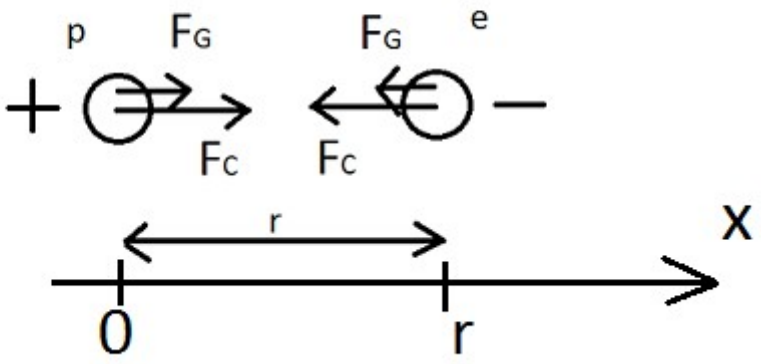
Work done for each problem	Credit for each problem
Sketch with coordinate system and lables	20%
Plan for solving the problem: which concept(s) to use	20%
Equation(s) that represent the above concept(s). Equations must be specific to the particular problem, for instance, use the coordinate system and labes from your sketch when you write the equations.	20%
Algebraic solution of the equations	20%
Numerical solution	10%
Answer with units	10%
Total	100%

Example: Giancoli, p. 465, problem 16-10

Compare the electric force holding the electron in orbit around the proton in the hydrogen atom with the gravitational force between the same electron and proton. Find the ratio of these forces.

Known: *from the problem:* distance between electron and proton r = 0.53×10^{-10} m;
from the book or internet:
charge on electron $q_1 = -1.60 \times 10^{-19}$ C; charge on proton $q_2 = 1.60 \times 10^{-19}$ C; proportionality constant in Coulomb's law k = 9.0×10^{9} Nm^2/C^2 ; proton mass $m_p = 1.67 \times 10^{-27}$ kg;
electron mass $m_e = 9.11 \times 10^{-31}$ kg; gravitational constant G = 6.67×10^{-11} Nm^2/kg^2

Unknown: Coulomb force F_C, Gravitational force F_G; ratio F_C / F_G
Solution:



Concepts: I will use the Coulomb's law and Newton's law of gravitation to solve this problem.

Equations: Coulomb's law $F_C = k\, q_1\, q_2 / r^2$; gravitation law: $F_G = G\, m_p\, m_e / r^2$;
ratio = $F_C / F_G = | k\, q_1\, q_2 | / | G\, m_p\, m_e |$ [the r^2 term cancels when two formulas are divided, the value of r is not even needed to solve this problem !]
This is the answer in a **symbolic form** !
Calculations: ratio = $| 9.0 \times 10^{9}\ Nm^2/C^2 \times (-1.60 \times 10^{-19}\ C) \times 1.60 \times 10^{-19}\ C |$ /

$$/\ |6.67 \times 10^{-11}\ Nm^2/kg^2 \times 9.11 \times 10^{-31}\ kg \times 1.67 \times 10^{-27}\ kg|$$

$$= 0.23 \times 10^{9-19-19-(-11)-(-31)-(-27)} = 0.23 \times 10^{40} = 2.3 \times 10^{39}$$ [units cancel]

Note1: We are interested in the ratio of the forces, not their directions. Therefore, we take absolute value of each force and thus ignore the negative sign. The **sign represents the direction** of the force. Note the opposite direction of the forces acting on proton and electron.

Note 2: The result is rounded to the smallest number of significant figures in the initial data, i.e. 2 figures.

Note 3: Carefully check and see that all units cancel out (**only in this problem !**) during the calculation.

Note 4: When dividing the powers of 10, the power in denominator must be subtracted.