PHYS 212 Syllabus

Summer II 2010

General information

Instructor: Dr. Victor Klymko

Email: vick@olemiss.edu

Web page: http://www.olemiss.edu/depts/physics_and_astronomy/faculty/klymko.html

Office hours: Monday, Wednesday, Friday 10 a.m. – 11 a.m. or by appointment

Office: 5 Kennon Observatory

Lecture: Monday, Tuesday, Wednesday, Thursday, Friday 8:00 – 9:50 a.m. in 109 Lewis Hall

Text: D. Halliday, R. Resnic, J. Walker, *Fundamentals of Physics,* 8th ed., J. Wiley and Sons, 2008, ISBN 978-0-471-75801-3

Description

This is the second part of a two-course sequence on physics for science and engineering. The first part of the sequence, PHYS 211, is a pre-requisite for this course. The students must also take, unless previously passed, the laboratory course PHYS 222.

The main topics discussed in PHYS 212 are electricity and magnetism, electric circuits, electromagnetic waves, optics, and some topics from atomic and nuclear physics.

The students are expected to have working knowledge of algebra, trigonometry, and calculus.

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 after every lecture and is due the following lecture. 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 10% of the credit.

Quiz: A 5 minute quiz will be given at the beginning of random classes. Each quiz will contain 2 questions. A short answer will be expected. The questions will reflect very basic, but important, concepts that were learned in class and by reading the textbook.

Tests Two **closed book** tests will be given. Test 1 (electricity and magnetism, circuits) is on July 14. Test 2 (electromagnetic waves, optics) is on July 27.

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

It will take place on Thursday, July 29, at 8 a.m., in 109 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 classes missed for ANY reason) – 10%
Quizzes - 10%
Homework assignments - 35%
Test 1 – 10%
Test 2 – 10%
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

Tardiness: A missed quiz at the beginning of the class will be given a zero grade. There will be no make-up for missed quizzes.

Late homework: A 10% **per day** penalty will apply for all late homeworks.

Missed test: Make-up **tests** are possible in three cases: 1) a documented illness, 2) participation in an official university activity, and 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. Generally, the make-up test will be 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 of lectures and tests

Date	Chapter	Topic
7/1	21	Electric Charge
7/2	22	Electric Fields
7/6	23	Gauss' Law
7/7	24	Electric Potential
7/8	25	Capacitance
7/9	26	Current and Resistance
7/12	27	Circuits
7/13	28	Magnetic Fields
7/14		**Test 1**
7/15	29	Magnetic Fields due to Currents
7/16	30	Induction and Inductance
7/19	31	Electromagnetic Oscillations
7/20	32	Maxwell's Equations
7/21	33	Electromagnetic Waves
7/22	34	Images
7/23	35	Interference
7/26	36	Diffraction
7/27		**Test 2**
7/28		**Review session**
7/29		**Final Exam**

Resources

Do read the textbook before attempting the homework.

Do read the textbook again before the quiz or 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.**

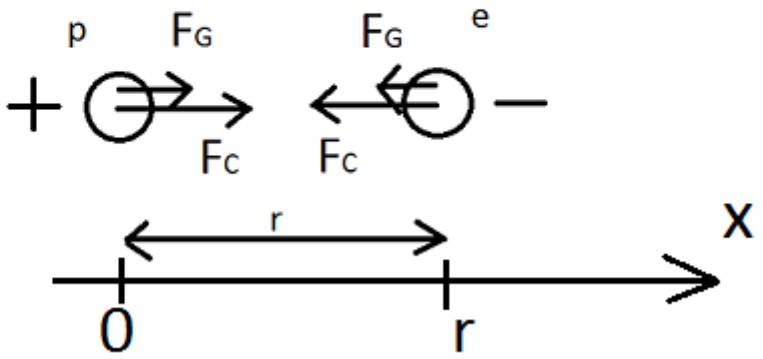
Example:

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 $r = 0.53 \times 10^{-10}$ 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 $k = 9.0 \times 10^{9}$ 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 $G = 6.67 \times 10^{-11}$ Nm^2/kg^2

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

Sketch:



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 x $(-1.60 \times 10^{-19}$ C) x 1.60×10^{-19} C | /

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