

DEPARTMENT OF PHYSICS  
LEHIGH UNIVERSITY

**Physics 13: General Physics II**  
*Spring Semester 2017*

**SYLLABUS (Please read carefully)**

**Initial Competences Required for this course (what you should know already)**

PHY 13, or General Physics II, follows PHY 10 and is the second part of General Physics. Like PHY 10, PHY 13 is a calculus-based introductory course to physics, and it is meant mainly for students oriented towards the biological and environmental sciences, or pre-med students. PHY 10 is a requirement for PHY 13, and the knowledge acquired during PHY 10 – in particular the application of Newton's Laws, as well as the laws of energy and momentum conservation – is a prerequisite. The mathematical skills required are: Simple operations with vectors (including adding and subtracting vectors, scalar product, and vector product) and use of basics calculus (derivatives and integrals). Physics 13 requires a little less use of calculus compared to the course taken by engineering and physics majors (PHY 21), still you will need to use integrals and derivatives in some very simple applications. If you did not take PHY 10 or PHY 11 last semester, you may also need to get back in shape with writing and solving algebraic equations: Do not worry if you will struggle the first couple of weeks with algebra, by seriously working at the homework you will automatically gain back your skills!

**Course contents (what will be taught in this course)**

Subjects covered in Physics 13 include electromagnetism, waves, ray optics, interference and diffraction, and an introduction to quantum-mechanics and nuclear physics (a few special relativity concepts are briefly introduced, too). The purpose of this course is to discuss these topics, and teach how to apply their underlying principles to the solution of concrete problems. A student's performance will not only depend on how well she is able to acquire new physics concepts, but also on her ability to solve more and more structured problems, also combining new knowledge with some of the ideas learned in PHY 10. This will be achieved through homework and practice; starting with simple situations, you will develop strategies for solving more and more complex problems.

**Competences expected after this course (what you will be able to do when done)**

After this course, students should be able to analyze both conceptually and quantitatively various situations encountered in physics. At a minimum, they will be able to:

- work with point charges: Forces, electric field, electric potential, electric potential energy, electric dipole moment.
- work with magnetic fields: Moving point charges, current-carrying wires or loops, magnetic dipole moments.
- work with circuits, including capacitors, inductors, RC-circuits, and LR-circuits
- understand the ideas of magnetic flux and magnetic induction, and be able to quantitatively analyze the effects of either a changing area, or a changing magnetic field, or a changing orientation between the area vector and the magnetic field. Apply Lenz's Law to correctly determine the direction of the induced current.
- work with waves, including standing waves on strings, and Doppler's effect .
- work with interference and diffraction.
- understand the ideas of quantization and wave particle duality (de Broglie), as well as analyze quantitatively the photoelectric effect and the Compton effect.

- understand emission and absorption of photons and quantitatively analyze some quantum energy transitions in the atomic model of Bohr.
- understand basic ideas about nuclear physics: Mass defect, binding energy, different radioactive decays.

Your performance will not only depend on how well you are able to acquire new physics concepts, but also on your ability to solve more and more complex problems. This last point is something you will learn by solving a lot of practical physics problems.

### **Instructor**

Prof. Paola M. Cereghetti

cereghetti@lehigh.edu

Office: LL 410

Office hours: I will be available Monday and Wednesday between 9am and 10am. To schedule an appointment at a different time is easy, simply e-mail me and we will figure out a time, thanks!

### **Class Meetings**

The lectures, attended by all students together, take place on Mondays and Wednesdays from **8:00am** to 8:50am in **LL270**. One meeting in smaller sections will take place on Fridays in LL316:

Recitation #1: PHY 010-110: 8:10am-9:00am

Recitation #2: PHY 010-111: 9:10am-10:00am

Recitation #3: PHY 010-114: 10:10am-11:00am

Recitation #4: PHY 010-112: 12:10pm-1:00pm

### **Textbook and Class Notes**

*College Physics* by Openstax College downloadable for free at <https://openstaxcollege.org/textbooks/college-physics/get> We will cover about half of the book. Class notes will be handed out in class. These notes are my calculus based extension of the College Physics textbook.

### **Homework**

Homework is an essential component of this course, it will be assigned weekly, and it will be due in the 8am class every Monday. The homework for this class is known to be quite long; however, a big part of the HW problems will be partially solved in class, making class attendance critical for the student who wish to be successful. **IT IS A VERY BAD IDEA TO START WORKING ON THE HOMEWORK ON SUNDAY NIGHT, AND THEREFORE HIGHLY DISCOURAGED!**

### **Homework solutions and extra practice exercises**

Homework solutions will be provided after the homework's deadline. Please make sure that you understand each problem that you have not been able to complete correctly. Practice packets (exercises with solutions) will be provided as a help to prepare for the hour exams and the final exam.

### **Work outside the classroom**

This is a 3-credit class. It is standard practice that for every hour of class 3 hours are spent studying or doing homework. Although reading the online textbook and reviewing my and your notes, as well as coming to class are essential, many of you will notice that working on homework and on extra practice exercises is key to reach proficiency and do well in the exams.

### **Attendance**

Since physics is an intensive subject, keeping up to date is essential. Consequently, **you are expected to attend all classes and to do all assignments on time.**

**Exams**

There will be 4 hour exams held during recitation (tentatively set on Friday, February 24, on Friday, March 24, on Friday, April 7, and on Friday, April 28, 2017) and a final exam (TBD). The hour exams and the final exam are closed book; you can prepare a one-sided equation sheet for each hour exam and an additional one for the final exam. During the final exam, you will be able to keep 5 one-sided pages of equations.

**Grading:**

Your numerical grade in the course will be determined as follows:

Attendance	10
Homework	20
4 Hour Tests	20
Final Exam	20
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<b>Total</b>	<b>70</b>

- The final exam is cumulative, the material from the entire semester will be tested.
- If you can justify with an official written excuse your absence during an hour exam, the grade for the hour exam that you missed will be taken from the grade of the corresponding section in the final exam.

**Accommodations for Students with Disabilities:**

If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, Williams Hall, Suite 301 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

**The Principles of Our Equitable Community:**

Lehigh University endorses The Principles of Our Equitable Community [[http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity\\_Sheet\\_v2\\_032212.pdf](http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf)]. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.

## How not to loose points in the HW

DO NOT FORGET TO: Write your name and recitation number on the top of the first page.

Recitation #1: PHY 010-110: 8:10am-9:00am  
Recitation #2: PHY 010-111: 9:10am-10:00am  
Recitation #3: PHY 010-114: 10:10am-11:00am  
Recitation #4: PHY 010-112: 12:10pm-1:00pm

- 1) “Yes,” or “no” answers alone, or any short answer without explanation, are not accepted.
- 2) Show your calculations.
- 3) Results without units are considered wrong.
- 4) Algebraic expressions in a result have to be simplified as much as possible.
- 5) Give the results of your numerical calculations as decimal numbers, results with, for example, fractions or square roots in them are not acceptable, and the problem will not be graded.
- 6) If I see only the material I covered in class as the solution to an unfinished problem, you will not get credit for the problem. Always finish problems we started or did in class.
- 7) When using vectors, use the bracket notation.
- 8) This course covers material beyond the usual high school material. If you already covered some physics material in high school or elsewhere, make sure to always keep track of details about topics you may have already worked with that are new to you, and, especially, of new techniques to solve and approach problems, I expect you to be able to use them in tests and homework.
- 9) Write Clearly!