

Physics 13: General Physics II

Spring Semester 2019

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), but you will still need to use integrals and derivatives in some 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, and combine 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 optical elements such as mirrors and lenses
- 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.

PHY 13
INSTRUCTION MANUAL



S.1. Instructor

Prof. Paola M. Cereghetti
cereghetti@lehigh.edu

Office: LL 410

Office hours: I will be available for office hours on Mondays from noon to 1:30pm and Wednesdays from 11:30am to 1:00pm.

S.2. Class Meetings

The lectures, attended by all students together, take place on Mondays and Wednesdays from 8:10am to 9:00am in LL270. Recitation 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

S.3. Tutoring

Allison Kayne and Grant Cummings have been assigned by the tutoring center to be tutors for PHY 13. They both have taken PHY 10 and PHY 13 with me, and succeeded excellently. Because they know my teaching style first-hand as well as my expectations in the course, I believe they will be a valuable source of help for all PHY 13 students, make sure to take advantage of that.

Walk-in tutoring and group tutoring times will be announced. Sign-up for group tutoring will take place the first week of the semester, and tutoring will begin the week after (second week of the semester).

S.4. Textbook and Class Notes

College Physics by Openstax College is 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 addition to the College Physics textbook.

S.5. Work outside the classroom

PHY 13 is a challenging 3-credit class. It is standard practice that for every hour of class at least 3 hours are spent studying or doing homework. Reading the textbook and reviewing your notes is important; what is even more important is working on homework independently and doing extra practice exercises independently

S.6. Attendance

Since physics is an intensive subject, keeping up-to-date with the material is essential. Consequently, you are expected to come to class on time and attend all classes. Should you be at risk of not receiving 100% credit for attendance, you will be notified.



S.7. Homework

All homework must be handed in at the due date. No homework will be accepted after that.

Homework is an essential component of this course, it will be assigned weekly, and it will be due every Wednesday before 8:10am or right after the lecture at 9:00am (no electronic submission allowed). Should you be at risk of not receiving 100% credit for homework, you will be notified.

Homework assignments are similar to those used in previous years; therefore, in order not to discriminate between students who manage to get solutions from previous years and students who do not, I will put all solutions to all homework problems on course site. However, it is important that you are disciplined enough to do problems without first looking at solutions. It is only through struggling on a problem that you will be able to learn the material taught in this course, even if you will not be successful at first. Each problem is constructed in such a way that you are made to practice more and more complex techniques. Once you are done with a problem, you can look at its solution. It is very important that you make sure you understand any differences between your work and the online solutions.

Homework assignments will not be graded for correctness but only for completion. Nevertheless, to make sure students are seriously doing homework and keeping up with the material, there will be quizzes every week in recitation that will cover topics of previous HW assignments. If you just copy the solutions instead of doing the homework yourself, you will do badly in the quizzes, and even more so in the exams.

HW problems will be partially solved in class, making class attendance critical for the student who wishes to be successful. **DO NOT START WORKING ON THE HOMEWORK ON TUESDAY NIGHT, IT IS A VERY BAD IDEA, AND THEREFORE HIGHLY DISCOURAGED!**

S.8. Quizzes

To test your understanding of previous homework, there will be a 10 minutes quiz every week. During weeks with exams, there will be no quiz. The worst 2 quizzes will not be counted. If you take a quiz and do everything wrong, you will still receive a grade of 1 (usually out of 4) for taking the quiz. Note that these numbers do not correspond to letter grades, but they are used to compute the contribution of quizzes to the final course grade. Should you be at risk of not receiving 100% credit in quizzes, you will be notified.

S.9. Homework solutions and extra practice exercises

Solutions to past homework problems will be posted online at the beginning of the week to help you understand the material. Make sure that you understand each problem that you have not been able to complete correctly, because quizzes will cover any one of the topics in the previous homework. Additional practice packets (exercises with solutions) will be provided; working on them will be an essential component of preparing for the hour exams and the final exam. Each packet will be available in a blank copy and in a solution copy; to learn and study effectively, you should first try to solve the problems alone on the blank copy, and only after having struggled on them a good amount of time, look at the solution. If you do this you will see that initially you will spend a lot of time on one problem, but things will become easier and easier as you continue to practice. The longer you had initially struggled, the quicker this process will be. Remember that each student is different in their approach to and facility with a subject; **it may happen that to obtain good results you need to study considerably more than your friends**; do not be discouraged by that, just keep going, put a lot of time into practicing, never delay things to the last minute, and ask questions in recitations or during office hours.

S.10. Instructional Videos

When videos are posted with the assignment to watch them before a class, it is mandatory that you do so. Videos will help you review in detail some of the most important material covered in class; therefore, watching the videos will be essential to build a solid base to understand the material covered in following classes.

S.11. Exams

There will be 3 hour exams (mid-term exams). The hour exams will take place in **LL270**, and will start at 7:50am. Dates for the 3 hour exams are: Monday, February 18th, Wednesday, March 20, and Monday, April 15th.

The final exam is cumulative, it will cover the material from the entire semester. The date of the final exam is still TBD by the Registrar, .

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-sided equation sheet for the final exam. During the final exam, you will be able to keep 4 one-sided pages of equations. Only formulas are allowed on the equation sheets; problem solutions of any kind (algebraic or numerical) and from any source (e.g. from homework, examples, quizzes, or sample tests) are NOT allowed on the note sheets.

S.12. Absences during exams:

There are no make up quizzes or exams.

- ☞ No make up quizzes. The worst 2 semester quizzes will not be counted; therefore, if you are absent for 2 quizzes, you will receive two 0 grades for those quizzes, but your grade will not be affected.
- ☞ For potentially missed or missed hour exams, please contact the department of physics. Contingent to an official written excuse for your absence in any of the 3 hour exams, the grade for the hour exam you may have missed will be taken from the grade of the corresponding sections in the final exam.
- ☞ If you cannot take the final exam on its official date and time, please announce that as soon as possible to the Dean of Students office. The Dean of Students will check the legitimacy of your excuse, and possibly allow you to take the final exam at the official make up date.

Attention: Any excuse from the Dean of Students Office without documents on file is not acceptable.

S.13. Grading

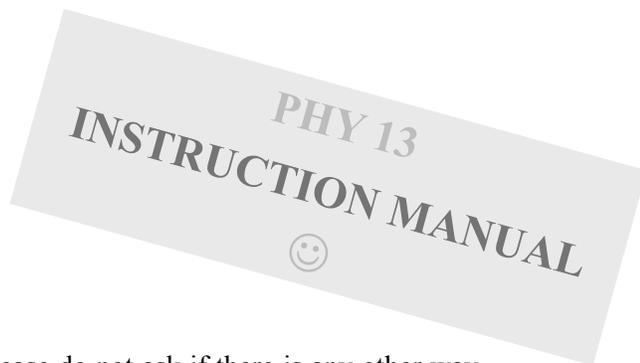
Your numerical grade in the course will be determined based on your performance in various activities, as detailed in the following table:

Attendance	10
Homework	10
Quizzes	10
3 Hour Tests	20
Final Exam	20

Total	70

S.14. No Extra Credit

There are no extra credits beyond what is listed above (S.13). Please do not ask if there is any other way to get additional credit and increase your grade. The break down above is set in advance, and it would be unfair to other students if some students get additional extra credit, while others do not.





S.15. Mistakes to avoid in quizzes and exams

Failure to apply what is listed in the following points will result in credit loss during quizzes and exams. Start to apply these points as early as possible. This list is not exhaustive.

- ☞ **Write Clearly!** If there is any room left for interpretation, the answer will be considered wrong.
- ☞ **When using vectors, use bracket notation**, otherwise the problem will not be graded.
- ☞ “Yes,” or “no” answers alone, or any short answer without explanation, are not accepted.
- ☞ Always show your calculations, and clearly erase calculations you thought were wrong. No credit for double answers will be given, you are responsible to choose the correct answer among your calculations.
- ☞ Results without units are always considered wrong.
- ☞ All algebraic expressions in a result have to be simplified as much as possible.
- ☞ 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.

S.16. Recommendation letters

Due to high demand, I generally only write recommendation letters for students who have taken my classes for more than two semesters, taking also one of the *Physics of Medical Imaging* courses with me (120/121, or 122/123). For all recommendations, I need at least a 3 weeks notice.

S.17. 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.

S.18. 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]. 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.

S.19. Student Senate Statement on Academic Integrity

We, the Lehigh University Student Senate, as the standing representative body of all undergraduates, reaffirm the duty and obligation of students to meet and uphold the highest principles and values of personal, moral and ethical conduct. As partners in our educational community, both students and faculty share the responsibility for promoting and helping to ensure an environment of academic integrity. As such, each student is expected to complete all academic course work in accordance to the standards set forth by the faculty and in compliance with the University's Code of Conduct.