PHY 10
INSTRUCTION MANUAL
☺

DEPARTMENT OF PHYSICS
LEHIGH UNIVERSITY

Physics 10: General Physics I

Fall Semester 2024

SYLLABUS

Please read carefully!

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

Before starting this course, students should already be able to do simple operations with vectors (including adding and subtracting vectors, scalar product, and vector product) and be familiar with basic calculus (derivatives and integrals). Physics 10 requires a little less use of calculus compared to the course taken by engineering and physics majors (PHY 11), but you will still need to use integrals and derivatives in some straightforward applications. Some of you may also need to brush up on writing and solving algebraic equations. Don't worry if you find yourself struggling with algebra in the first couple of weeks. Diligently doing the homework will help you regain your skills!

Course contents (what will be taught in this course)

Physics 10 is the first part of General Physics (General Physics I; General Physics II is Physics 13). It is a calculus-based introductory course to physics, primarily intended for students in biological and environmental sciences, computer science, architecture, or pre-med studies. Subjects covered include mechanics, energy, momentum, thermodynamics, and fluids. The purpose of this course is to introduce these topics and teach students how to apply the underlying principles to solve concrete problems. Starting with simple problems, you will learn to develop strategies for addressing increasingly complex ones.

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:

- Calculate and predict the motion of projectiles, or rotating objects
- Critically analyze situations of both equilibrium and non-equilibrium in translational and rotational motion using Newton's Laws, with or without friction.
- Set up equations based on energy conservation for various situations involving different types of forces, ranging from pulleys and weights to the oscillatory motion of springs and pendulums, with or without friction.
- Use momentum conservation to analyze systems involving one-dimensional and two-dimensional collisions between massive objects, or the rotation of a solid body with a changing moment of inertia. This includes discerning when it might be more appropriate to use energy conservation instead.
- Analyze the physics of fluids, whether in containers or flowing through pipes, using the equation of continuity, Bernoulli's equation, and Archimedes' principle.
- Analyze pressure-volume diagrams for an ideal gas and the behavior of thermal machines using the laws of thermodynamics.

Your performance will not only depend on how well you acquire new physics concepts but also on your ability to solve increasingly complex problems.

S.1. Instructor

Prof. Paola M. Cereghetti
cereghetti@lehigh.edu

Office: LL 410

Office hours: Office hours will begin the second week of the semester. I will review material and answer questions every Tuesday from 11:00am to 1:00pm. Additionally, I will be available to answer questions on Tuesdays & Thursdays immediately after the 10:10am lecture. If you need to schedule a one-on-one meeting, please email me. Note that office hour times may change; if they do, you will be notified

Tutoring before exams: Make sure to take advantage of the additional tutoring sessions with me that will be announced before exams.

S.2. Class Meetings

Lectures for all students are scheduled on Tuesdays and Thursdays from 9:20am to 10:10am in LL270. Smaller section meetings will be held on Mondays and Wednesdays in LL514:

Recitation #1: PHY 010-110: 7:55am-8:45am
Recitation #2: PHY 010-111: 9:20am-10:10am
Recitation #3: PHY 010-112: 10:45am-11:35am
Recitation #4: PHY 010-113: 12:10pm-1:00pm

S.3. Lehigh Tutoring

Walk-in tutoring and group tutoring sessions are available through the tutoring center. For details and to register for tutoring, please visit https://studentaffairs.lehigh.edu/content/tutoring. Additionally, consider participating in the Study Group Program available at https://studentaffairs.lehigh.edu/success/academic-support/study-group-program .

S.4. Textbook and Class Notes

The textbook for this course is "University Physics" by OpenStax College, which is available for free download. We will be covering content from Volume 1 (https://openstax.org/details/books/university-physics-volume-1?Book%20details), and the thermodynamics sections of Volume 2 (https://openstax.org/details/books/university-physics-volume-2). **Class notes will also be available on course site.**

S.5. Work outside the classroom

PHY 10 is a challenging 4-credit course. It's standard practice to spend at least 3 additional hours per credit each week, studying or doing homework (12 hours each week for this course). Reading the textbook and reviewing your notes is crucial; however, working on homework independently and doing extra practice exercises on your own is even more essential (refer to Section 9 below).

S.6. Attendance

Because physics is an intensive subject, it's essential to stay current with the material. Consequently, you are expected to arrive on time and attend all lectures and recitations. You're permitted to miss up to 2 recitations, *whether you have an official excuse or not*. If you miss more than 2 recitations, you will lose 0.5 points out of 10 for each additional absence (refer to Section 13 on Grading below).

S.7. Homework

All homework must be submitted by the due date. **No submissions will be accepted afterward.**

One point will be deducted for each missed homework assignment, out of a possible 5 points (see S.13 Grading below). In extenuating circumstances, please inquire about the possibility of a deadline extension, and I will consider it..

Homework is an essential component of this course. It will be assigned weekly and is due during recitation every Wednesday. **Electronic submissions are not permitted**, and answers must be written on the provided blank homework sheet.

New homework assignments and their solutions will be posted on course site at the same time. However, it is important that you are disciplined enough to first tackle problems without looking at the solution. Struggling with a problem helps you learn the material and skills taught in this course and familiarize yourself with each new concept. Remember, even if you don't successfully complete a problem, the attempt is valuable. Each problem is designed to have you practice increasingly complex techniques. Once you've worked on a problem, you can check its solution. Make sure you understand any differences between your work and the solution.

Homework assignments will be graded based on effort and completion. To ensure students are diligently completing homework and staying updated with the material, weekly quizzes will be conducted during recitation sessions. These quizzes will cover topics from previous homework assignments. If you merely copy the solutions without genuinely working through the homework, your performance on the quizzes, and especially the exams, will suffer.

Some homework problems will be partially solved in class, making class attendance critical for the student who wishes to be successful.

> **DO NOT START WORKING ON A HOMEWORK ASSIGNMENT THE NIGHT BEFORE IT IS DUE. IT IS A VERY BAD IDEA, AND THEREFORE HIGHLY DISCOURAGED!**

S.8. Quizzes

To test your understanding of previous homework, there will be a quiz every week. So as not to disrupt the flow of the class, students arriving late will still have to hand-in the quiz together with the rest of the class. If you have a special accommodation please see your instructor.

There are no make-up quizzes, but in case of need ask if you can take the quiz the same day in an earlier or later recitation (see S.2. Class Meetings). You are allowed to miss up to 2 quizzes *with or without an official excuse*. If you miss more than 2 quizzes, you will lose 1 point out of the 5 available for each additional missed quiz (see S.13 Grading below, *e.g.* if your grade in quizzes is 4 out of 5, with a third missed quiz you'll drop to 3 out of 5). Your instructor will consider extenuating circumstances. Quizzes often count for a maximum of 4 points; however, note that such numbers do not correspond to letter grades, but they are used to compute the contribution of quizzes to the final course grade. If you are present for a quiz, you will receive 1 point even if all your answers are wrong.

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 both as a blank copy and 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 for a significant amount of time, look at the solution. If you follow this method, you'll notice that initially you might spend a lot of time on one problem, but that things will become easier as you continue to practice. 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 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

Instructional videos covering the course material will be available on course site. These will help you review key content and develop problem-solving skills. Videos of lectures from previous years will also be posted; while they might differ slightly, the material is the same. Please ensure you watch all videos assigned in class, as they might cover essential content not presented in lectures or recitations.

S.11. Exams

There will be three hour exams on the following dates: Tuesday, October 1, 2024; Tuesday, October 22, 2024; and Tuesday, November 12, 2024. Additionally, there will be a final exam, the date of which is yet to be determined. All exams are closed book, but an equation sheet will be provided with each exam.

Personal equation sheets are not permitted.

The hour exams will assess the newly taught material up to the date of each respective exam.

The final exam is cumulative, the material from the entire semester will be tested.

Students are expected to adhere to the Student Senate Statement on Academic Integrity (refer to S.20). Each exam will have specific rules printed on its front page. For the first three hour exams, students may only exit the room after submitting their completed exams. If you choose to wear a cap during an exam, ensure the visor is pointed backward to keep your eyes visible. Devices that can store or access information are not allowed.

S.12. Absences during exams:

There are no make-up quizzes or make-up hour exams.

- ☞ No make-up quizzes will be given. Every student must adhere to this rule. You have the allowance to miss up to 2 quizzes, and only the scores from your best 6 quizzes will be considered.
- ☞ No rescheduling for hour exams. All students must adhere to this. All hour exams are to be taken at the designated date and time. If a student, with a verified written excuse from the Dean of Students office (located in Williams Hall, Suite 390, contact 610-758-4159), misses one of the 3 hour exams, their hour exam grade will be based solely on the two exams they completed. If a decision is made to drop the lowest exam score for all students, the missed exam will be considered as the lowest score exam for the student in question. *Valid excuses require documentation verified by the Dean of Students office*. Excuses without proper documentation are not valid.
- ☞ The final exam is scheduled for the official date and time set by the registrar. If students miss the final exam due to unforeseen circumstances or sudden illness, an SOS petition must be filed and the Dean of Students office should be contacted immediately to seek permission for a make-up exam. It's crucial to note that the decision for a make-up final lies with the SOS committee, not with the course professor.

  THERE WILL BE NO MAKE-UP FINAL EXAM DURING THE OFFICIAL FINAL EXAM PERIOD. Eligible students must take their make-up final exams on the designated reschedule date provided by Lehigh. For reference, recently the make-up exam was scheduled on the Saturday preceding the spring semester's start. As of this syllabus creation, the official make-up exam date for this semester hasn't been determined. Note: Remote make-up exams are not permitted.

  For students with accommodations: Should you miss the official final exam due to reasons tied to your accommodations, reach out to Dean Zullo at maz317@lehigh.edu . Student-athletes with an athletic event scheduled on the final exam's official date should contact Alexis Rauth, the Director of Student-Athlete Academic Services, at asr524@lehigh.edu.

S.13. Grading

Your numerical grade for the course will be calculated based on your performance in various activities, as shown in the following table:

Attendance	10
Homework	5
Quizzes	5
3 Hour Exams	25
Final Exam	25
Total	**70**

S.14. No Extra Credit

There will be no additional credits beyond what's outlined in S.13. Please refrain from requesting alternate methods to earn extra points. The grading breakdown is predetermined and must be the same for all students.

S.15. Mistakes to avoid in quizzes and exams

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

- ☞ **Penmanship Matters!** Ensure your writing is legible. Ambiguous answers due to unclear writing will be marked incorrect. Post-assessment explanations will not be considered..
- ☞ **Use column notation for vectors.** Any other format will result in the problem not being graded.
- ☞ Answers that consist solely of "yes" or "no", or any brief responses without a supporting explanation, will not be accepted—even if the question doesn't explicitly ask for justification.
- ☞ 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.
- ☞ Ensure that all algebraic expressions in your solutions are simplified to their fullest extent. Neglecting obvious simplifications will result in the solution being marked incorrect at the grader's discretion.
- ☞ Numerical results without appropriate units will always be regarded as incorrect.
- ☞ Numerical results not presented as decimal numbers will always be considered incorrect.

S.16. Recommendation letters

Due to high demand, I generally write recommendation letters for students who have taken at least 3 credits of *Physics of Medical Imaging* courses with me (PHY 120 or PHY 122 in the Lehigh catalog). I kindly request a minimum of 3 weeks' notice for all recommendation requests.

S.17. Accommodations for Students with Disabilities:

Lehigh University is committed to maintaining an equitable and inclusive community and welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact Disability Support Services (DSS), provide documentation, and participate in an interactive review process. If the documentation supports a request for reasonable accommodations, DSS will provide students with a Letter of Accommodations. Students who are approved for accommodations at Lehigh should share this letter and discuss their accommodations and learning needs with instructors as early in the semester as possible. For more information or to request services, please contact Disability Support Services in person in Williams Hall, Suite 301, via phone at 610-758-4152, via email at indss@lehigh.edu, or online at https://studentaffairs.lehigh.edu/disabilities .

S.19. 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.20. 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.

APPENDIX

Below you can find precious additional information, make sure to read it!

A.1. Physics is like musics or sports

Learning physics is similar to practicing a musical instrument. Like playing scales on a violin, consistent practice enhances your abilities. Spending time on physics problems, even without finding a solution right away, is always valuable. Some students might need more practice, like a musician mastering a scale. However, this doesn't imply that the student can't excel in physics.

Consistency over time is another crucial aspect of practice. For instance, if you have a concert a month away, it's more effective to practice an hour every day rather than cramming for 30 hours a few days before. Opting for the latter might lead to poor performance in the concert or even potential injury. Practice needs to be spread out over time.

Here's another example: Consider a weight lifter aiming to secure a medal in an upcoming competition with a two-month timeframe. It's more beneficial for her to engage in regular, consistent practice sessions throughout these two months rather than intense, continuous training right before the event. Even if the total practice time during those last few days matches what she could have practiced over the past two months, the latter approach will likely yield inferior results and hinder progress. Once more, the key takeaway is that effective practice occurs over an extended period for optimal outcomes.

A.2. For new and experienced physics students

This course extends beyond typical high school content (including AP physics). If you've encountered physics concepts before, remain attentive to new details, even in familiar topics. Focus on novel problem-solving techniques as they'll be required in tests and assignments.

From my experience, I'm less concerned about students new to physics who are diligent learners. My concern lies more with those who've had prior exposure to physics and feel overly confident. Often, a number of weeks into the semester, many overconfident students may suddenly realize that they are significantly behind with the material.

A.3. What if your efforts in studying aren't yielding desired outcomes?

As previously mentioned, PHY 13 is a demanding 3-credit course. It's generally recommended to dedicate around 3 weekly hours of studying or homework for every credit hour. Keep in mind that this is an average, and individual needs may vary. Some students might excel with less than 3 hours per credit per week, while others may require more. It's crucial that these study hours are focused and free from distractions like cell phones, TV, or socializing – unless your study style accommodates these. Additionally, breaks should not be counted as study time.

If you feel that you are putting in a lot of effort but not achieving the results you desire, avoid comparing yourself to your peers. Every individual's skills vary, and some students may study less yet achieve higher grades. This is a reality beyond your control. Instead, focus on assessing the time you allocate to different activities and consider making adjustments. It's essential to develop a study strategy that suits your learning style and needs.

Attend all lectures and recitations. Some students think that skipping class is a better option when they're struggling to understand the material. However, this approach is not recommended. Even if you find the content difficult, being present in class allows you to identify your areas of confusion. This way, you can dedicate your study time to addressing these challenges, seeking help, and asking questions. If you choose to skip class, you'll end up tackling these issues alone, which can be more time-consuming. Therefore, attending class is the more efficient choice.

During your study sessions, prioritize understanding the material taught in class and revisiting the discussed problems. Begin by attempting to redo the in-class problems without referring to your notes. If you encounter difficulties, consult your notes, and if needed, refer to the provided solution. Embracing the challenge of problem-solving is a fundamental part of mastering physics.

You have access to homework solutions, but it is important not to copy them directly. Before looking at the solutions, challenge yourself to spend a minimum of 20 minutes grappling with each homework problem independently.

Make it a priority to watch all the instructional videos on course site once they are available. Avoid delaying this task until just before the exams. While you might review some videos closer to the exam days, ensure that this doesn't compromise your practice time.

To prepare effectively for exams, complete all the problems in the practice packets at least a week prior to the exam. To make the most of your practice, print out the blank practice sheets and work on solving the problems without referring to solutions. Initially, you might find it challenging to complete a problem without looking at the solution. Don't be discouraged—your proficiency will improve with practice as you gradually rely less on the solutions.

As you gain confidence in problem-solving, begin timing yourself. Aim to solve each long problem in around 15-20 minutes. If you find yourself working on a problem beyond the time limit, use a different colored pen to finish it. This will help you assess your problem-solving speed and provide additional practice as you finalize the solution.

If you discover that your speed isn't where you want it to be, it could indicate gaps in your understanding of the material or techniques, or you might need more practice. This highlights the importance of starting your work on the practice packets well in advance.

Lastly, it is crucial to be honest with yourself. Are you dedicating the necessary amount of time to studying physics? Are you maintaining discipline and avoiding distractions? This self-evaluation requires candid reflection. Regrettably, this is one aspect where your professor cannot provide direct assistance—the solution lies in following the guidelines outlined above. Keep persevering; many students have excelled in this course, and you can too, especially if you've read the entire syllabus by the first week of the semester!