PHYS 1251 - Introductory Studio Physics for Engineers I

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Class Hours: Mon,Fri 1:50-2:40 PM and Wed 1:50-3:50 PM Class Room: Physics 0303
Student drop-in hours: TBD Office: Physics Building Room 236

Introduction

Welcome to Physics 1251! This course is the first semester of introductory level physics sequence for engineering majors. This semester focuses on mechanics, the study of motion. Understanding the motions of objects and their interactions is one of the principal goals of physics. The fundamental laws of mechanics, first enumerated by Isaac Newton in the 17th century, can be applied to an enormous range of phenomena on scales as diverse as dust grains and galaxies.

The primary objective of this course is to engage you in a process that is central to physics: modeling physical phenomena by applying a small set of fundamental principles. The modeling process encompasses explaining and predicting physical behaviors; making appropriate approximations and simplifications for complicated physical systems; and communicating results through mathematical and numerical expressions, diagrams and visualizations, graphs, and even "plain English."

Important Dates

Midterm #1 ..... Friday, September 20: 1:50-2:40 pm
Midterm #2 ..... Friday, October 18: 1:50-2:40 pm
Midterm #3 ..... Friday, November 15: 1:50-2:40 pm

Final Exam (comprehensive): **Tuesday, December 10th 7-10pm**
For the full UGA final exam schedule, please visit https://reg.uga.edu/general-information/calendars/final-exam-schedule/

Student Learning Outcomes:

In completing this course, students should be able to:

- **Organize knowledge**
  - Articulate the ideas from each chapter, lecture, and make connections between different concepts.
  - Organize their content knowledge to apply to solve a particular physical problem.
- **Visualize the problem**:
  - Sketch the physical parameters as appropriate for a particular scenario.
- **Math/physics connection**
  - Explain the physical meaning of the mathematical formula.
  - Translate a physical description of a problem to a mathematical formula necessary to solve it.
- **Communicate their approach**
  - Justify and explain their thinking and approach to solve a problem in either written or oral form.
- **Develop problem-solving techniques and strategies**
  - Choose and apply the appropriate problem solving technique to a particular problem.
  - Identify/categorize problem-solving techniques based upon underlying principles rather than contexts.
  - Identify alternate methods of solving a given problem.
  - Recognize common mistakes/wrong turns and learn to recover from those mistakes.
- **Expect and check a solution**
  - Articulate their expectations for the solution to a problem as appropriate.

Prerequisites/ Co-requisites:

You should be comfortable with college algebra, trigonometry, and plane geometry. Some differential calculus will be used in the course. It is important that you be registered for the first semester of the calculus sequence (Math 2250 or equivalent), if you haven't already taken it.

You should also have an understanding of some elementary science concepts such as scientific notation, significant figures, units and dimensions, and graphing. A prior high school physics course is useful, but not required.

Required Materials

- **Textbook**: You may choose either one. Please try the free textbook first (link below) and if you do not like the free one, then try the paid one.

  - **Free textbook**: The free electronic textbook is *University Physics* by Samuel J. Ling, William Moebs, and Jeff Sanney. It is published by the OpenStax open educational resources project and is available for free in various electronic formats: online, PDF, iBooks, and Kindle. You can also order a print version if you prefer that format. You will need Volume 1 for this class.

    (https://openstax.org/details/books/university-physics-volume-1)
  - **Paid textbook**: The official textbook for 1251 (and 1252) is *Physics For Scientists and Engineers, 6th ed.*, by Tipler and Mosca (W. H. Freeman). You may use older editions if you wish, but you're responsible for knowing about any changes in content. Volume 1 is what we will use for this class. The bookstore should have this available as a bundle with an Achieve license.
- **Pre-class lecture videos**: These will be assigned through eLearning Commons assignments (https://elc.uga.edu/).
- **Calculator**: You will be allowed to use a calculator. A simple calculator such as the TI-30X series will do just fine, but a fancier graphing calculator is also acceptable. However, on exams, you will be limited to the functions that a standard scientific calculator can perform.

Online Resources

- **UGA Email**: Please check your UGA email daily. The UGA email system will be used infrequently for announcements.
- **eLearning Commons**: The eLearning Commons will serve as a repository of course information, including announcements, homework solutions, exam solutions, grades, and more.
- **Online Assignments**: Both before and after class, online assignments are an essential part of the course. You'll complete this work:
  - **Before class**: Within eLearning Commons assignments https://elc.uga.edu/.
  - **After class**: Assignments on the LON-CAPA homework system at https://spock.physast.uga.edu/.

Other Resources

- If you need help with understanding principles and concepts from class or homework assignments, I do encourage you to first talk to your colleagues. If that is not helping come see me during my student drop-in hours. If you need additional time please set up an appointment (by email);
- Tutors are available either through the Division of Academic Enhancement (https://ossa.uga.edu/services/peer-tutoring/) at Milledge Hall and Miller Learning Center and Department of Physics and Astronomy (https://www.physast.uga.edu/department-tutors).

Assessment and Grading

Your overall grade will be determined from your course performance, weighted as follows:

20% Cumulative final exam grade

45% Three midterm exams (20%/15%/10% for highest/middle/lowest grades)

10% Homework grade (LON-CAPA)

15% Laboratory grade

05% Pre-class preparation (pre-lecture videos, questions)

05% In-class participation (clickers, minute papers, and problem-solving)

- Letter grades will be assigned based on your overall numerical grade according to the following scale: A: $\geq$ 90.0, A-: $\geq$ 87.5, B+: $\geq$ 85.0, B: $\geq$ 80.0, B-: $\geq$ 77.5, C+: $\geq$ 75.0, C: $\geq$ 70.0, C-: $\geq$ 67.5, D: $\geq$ 60.0, F: $<$ 60.0.
- Overall numerical grades will not be rounded (i.e., 89.99 is still an A-).
- Any requests for a regrade of an assignment or exam must be made no later than one week after it's returned. For a regrade I will look at the entire assignment/ exam, not just one problem, and this may ***raise*** or ***lower*** your score. Regrade requests (including those for online homework) should be accompanied by all your work;
- Like any other measurement, grades possess a degree of uncertainty. Factors such as improvement, effort, and participation may help borderline grades. Lobbying, however, will not, and requests for extra credit will be ignored, so don't ask!

Exams

- **All tests/exams will be in-person**. Students with DRC accommodations can take your tests at UGA DRC's physical space.
- There will be three midterm exams and a final exam. All exams will be closed-book and closed-notes. Cell phones and other devices should be put away and/or turned off. **Possible plagiarism/unauthorized assistance includes, but is not limited to: accessing Chegg or similar during or after an exam**. The format of the exams will be discussed in class but will include conceptual as well as problem-solving questions. You may use a scientific calculator for arithmetic only; all memory and programs must be cleared. A formula sheet for each exam will be provided and posted on eLC (at least one week) before the exam. The formula sheet's purpose is to release you from memorizing formulas and allow you to focus your studying on understanding the principles and concepts involved.
- Unless told otherwise, you must show your work on each problem in order to receive full credit. Partial credit is awarded (based on your work) for incomplete or incorrect answers, so it is usually in your best interest to attempt every problem. Detailed solutions will be posted to eLC after each in-class exam.
- **In general, there will be no make-up midterm exams**. If you know that you will miss an exam for an event outside of your control (e.g. university athletics, ROTC training, etc.), make-ups may be offered on a case-by-case basis ahead of the exam date. Otherwise, your

final exam grade will be substituted for one of your midterms, making your final exam worth 30-40% of your overall grade (depending on how this grade compares to your other midterm exam grades). You must contact me as soon as you know of the conflict (before the exam if at all possible), and you must provide sufficient documentation in a timely fashion. (An example of unacceptable documentation is a note stating only that you visited the health center, with no indication of the severity and nature of your illness.) Do not presume that your situation or documentation merits an excused absence; that determination is not your prerogative. **Unexcused exam absences will result in an exam grade of zero**.

- **Make-up final exams** will be given only for students with legitimate, documentable reasons and MUST be arranged PRIOR to the final exam.

Homework

- Sustained practice with physics problems is crucial to understanding physics, so you will have regular homework assignments. Assignments will be posted online through LON-CAPA (https://spock.physast.uga.edu/) and most problems will require you to submit your answers online. However, a few assignments may also have a handwritten component. Detailed solutions will be posted to eLC after the due date.
- Assignments will be weighted equally unless otherwise specified. At the end of the semester, provided that you complete a course evaluation, I will drop your lowest two assignment percentages in calculating your overall score. (If you don't submit a course evaluation during the allotted time, then none of your assignments will be dropped.) Late homework won't be accepted or excused. However, even if you miss the deadline to submit homework answers for credit, you should still make every effort to work through all the problems on every assignment, in order to master the topics covered. You will likely do very poorly on exams if you don't work through each assignment in its entirety.
- Teamwork is an effective way to learn, so I encourage you to collaborate with your classmates. Ask them questions; critique others' work; explain your reasoning to your study partners. However, don't mistake teamwork for plagiarism. You're responsible for understanding all the details of every solution, and your solutions must be your own. Copying from any source of homework solutions is a violation of academic honesty policies. Since you can't collaborate on exams, homework is your best opportunity to develop your own problem-solving skills.
- Seeing worked examples of similar problems can be a great way to solve a new problem. Therefore, consulting Chegg or a similar resource is not in itself a violation of academic honesty policies. However, directly copying an answer without any cognitive effort on your end (such as only typing numbers in the calculator) is not acceptable.

Labs

- Lab activities will usually take place during the longer class on Wednesdays, although you might also perform "mini-labs" during some other classes.
- Lab work is a group effort; your group will hand in one report to be graded as a team. Because teamwork is important to the success of labs, there are no make-up labs. If you

miss a lab, your next lab may be "double-counted" at the instructor's discretion to make up for the missed lab.

Class preparation

- Pre-class lecture video viewing through eLearning Commons assignments (https://elc.uga.edu/) and textbook reading take the place of in-class lectures. This preparation before class is essential for you to learn well in class, just as it would be for a literature course. You'll regularly answer a few questions before class based on these materials to gauge your understanding.

In-Class Activities

- You will often be asked in class to work on conceptual and quantitative questions, both individually and in small groups. These activities allow you to demonstrate your sincere effort and active class engagement;
- These will typically be graded based on completion. End of class assignments are typically posted on eLC and can be made up for a limited period if you miss class while class participation and group work activities cannot be made up.

Course Policies

Academic Honesty

- UGA has a comprehensive academic honesty policy, A Culture of Honesty, which is available from the Office of Instruction at http://honesty.uga.edu/. This policy covers all academic work. All students are responsible for fully understanding and abiding by this policy. If you have any questions about the appropriateness of your actions or your work, you are obligated to ask me for clarification;
- I take the issue of academic honesty very seriously, and it is my responsibility to uphold the University's policy. This means, among other things, that I won't hesitate to report evidence of dishonesty to the Office of the Vice President for Instruction. Typical consequences of academic dishonesty on homework or an exam range from receiving a zero for that grade, to failing the course, to being suspended from the university.
- Students are expected to adhere to the university honor code: "I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others." A Culture of Honesty, the University's policy and procedures for handling cases of suspected dishonesty, can be found at www.uga.edu/ovpi.

Disability Accommodations

- I will make every reasonable effort to accommodate students with documented disabilities. Students requesting accommodations must provide documentation from the Disability Resource Center during the first two weeks of class (or within two weeks of DRC certification).

Withdrawals/Incompletes

- The Undergraduate Bulletin (http://www.bulletin.uga.edu/) and the Registrar's Office website describe the University policies regarding withdrawals and in-completes (http://reg.uga.edu/policies/withdrawals). If you don't complete the initial required administrative tasks of the course (e.g., the questionnaire), or are demonstrably not attending class and completing work, I may withdraw you from the course for "excessive absence";
- If you are considering withdrawing from the course, you should discuss your choice with me beforehand
- A grade of incomplete is not appropriate for a student who has missed a large portion of the course assessments, for whatever reason.
- **The withdrawal deadline is Monday, October 21**.

Well-being, Mental Health, and Student Support

- UGA Well-being Resources promote student success by cultivating a culture that supports a more active, healthy, and engaged student community. Anyone needing assistance is encouraged to contact Student Care & Outreach (SCO) in the Division of Student Affairs at 706-542-8479 or visit sco.uga.edu. Student Care & Outreach helps students navigate difficult circumstances by connecting them with the most appropriate resources or services. They also administer the Embark@UGA program which supports students experiencing, or who have experienced, homelessness, foster care, or housing insecurity.
- UGA provides both clinical and non-clinical options to support student well-being and mental health, any time, any place. Whether on campus, or studying from home or abroad, UGA Well-being Resources are here to help.
  - Well-being Resources: well-being.uga.edu
  - Student Care and Outreach: sco.uga.edu
  - University Health Center: healthcenter.uga.edu
  - Counseling and Psychiatric Services: caps.uga.edu or CAPS 24/7 crisis support at 706-542-2273
  - Health Promotion/ Fontaine Center: healthpromotion.uga.edu
  - Disability Resource Center and Testing Services: drc.uga.edu
- Additional information, including free digital well-being resources, can be accessed through the UGA app or by visiting https://well-being.uga.edu.

Technology Policy

- Cell phones should be turned to silent or off during class. Students should limit texting, checking email, posting to social media, etc. These activities are distracting and disrespectful to your fellow students. Tablet computers and convertible laptops in tablet mode may be used with a stylus for the purpose of taking notes. Typing notes on a traditional laptop is not very effective for a class like this, because of the large number of diagrams, graphs, and equations required.

- Generative Artificial Intelligence tools like ChatGPT are not prohibited on non-exam assignments in the class but are **strongly discouraged**. Information provided by such tools may be inaccurate, incomplete, or problematic. Any information provided by an AI should be checked with another source.

Student Responsibilities:

- You have the right to expect courtesy from your fellow students, and the same will be asked of you. Courtesy includes the expectation that everyone will come to class ready and willing to learn and interact, and able to ask or answer questions freely. Courtesy also implies that you arrive on time, stay until the end of class, and remain focused during class.
- Attendance is required. Class attendance keeps you well connected to the course and to the members of your group. In physics courses, each new concept builds on earlier ones, so mastering key concepts is critical. If your schedule makes it difficult to attend class regularly and on-time, you shouldn't take this course.
- The most common causes of missed classes are lack of sleep and time pressure from other obligations. If this starts happening to you, you need to seek out advice on how to set priorities and manage your time effectively.
- If you miss class, it's your responsibility to find out from other students what you missed. Talk to your group-mates, and notify them of your absence in advance if possible. They're relying on you to be caught up by the time you return to class.
- You must prepare for class. Class time is valuable and limited. Using that time effectively requires that you've had some exposure to the necessary concepts. Evidence from other courses with this format suggests that the time you spend preparing for class significantly reduces the amount of time needed for homework. Finally, class discussion will not cover all of the assigned material.
- Ask for clarification on anything you find unclear or ambiguous. This includes both course policies and physics topics. Ignorance is never a valid excuse. It's your responsibility to show me what you do and don't understand through your questions, so that I can help you learn. You help influence the pace of the course. Silent confusion benefits no one.
- I can't emphasize enough the importance of homework! Just as with other areas of learning, your physics problem-solving skills will improve only by practicing regularly and conscientiously. You'll get very little value out of homework if you depend on the efforts of others. If you start to get behind, get help early before the problem gets worse!

Tentative Schedule

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.

Week	Dates	Topics	Wednesday activity	Notes
1	8/14 - 8/16	Intro and diagnostics; Scalars vs vectors; 1-D & 2-D vectors	Double Period Class	
2	8/19 - 8/23	Vector addition and subtraction; Kinematics Quantities & Graphs	Double Period Class	
3	8/26 - 8/30	1-D & 2-D Kinematics; Free fall	Lab Activity 1: Vector Addition	
4	9/2 - 9/6	Projectile Motion	Lab Activity 2: Inclines	No class on Monday (Labor Day)
5	9/9 - 9/13	Relative Motion; Uniform circular motion	Lab Activity 3: Video Analysis of Projectile Motion	
6	9/16 - 9/20	Rotational kinematics	Double Period Class (Exam 1 review)	Exam 1
7	9/23 - 9/27	Newton's Laws of motion; Frictional forces	Double Period Class	
8	9/30 - 10/4	Forces on circular motion; Connected objects (ropes and pulleys)	Lab Activity 4: Newton's Second Law	
9	10/7 - 10/11	Work & Energy; Work Energy Theory; Hooke's Law	Lab Activity 5: Uniform Circular Motion	
10	10/14 - 10/18	Other forces	Double Class Period (Exam 2 review)	Exam 2
11	10/21 - 10/25	Conservation of Energy; Extended Work-Energy Theory	Double Class Period	No class on Friday (Fall Break)
12	10/28 - 11/1	Power; Linear Momentum; Conservation of Linear Momentum; Center of Mass	Lab Activity 6: Elastic Systems and Hooke's Law	
13	11/4 - 11/8	Collisions	Lab Activity 7: Ballistic Pendulum	
14	11/11 - 11/15	Angular Momentum	Double Class Period (Exam 3 review)	Exam 3
15	11/18 - 11/22	Rotational kinetic energy; torque	Lab Activity 8: Rotational Kinetic Energy and Inertia	

16	11/25 - 11/29	Review	No Lab (Thanksgiving)	No class on Wednesday or Friday (Thanksgiving)
17	12/2 - 12/6	Review	None	Friday Class Schedule in Effect on Tuesday; No class on Wednesday (Reading day)
18	12/9 - 12/13	Exam week	None	Final Exam (Thursday 7pm)