Grinnell College
Physics Department
PHY 131: General Physics I with lab

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Office Hours: Tuesdays 2:00–5:00 pm, Fridays 1:00–3:00 pm, or by appointment
Lecture: MWF Noyce 1023, 8:00 – 8:50 am (section 1), 10:00-10:30 (section 3)

Please turn off cell phones and refrain from surfing the web during class time!

Text: Halliday, Resnick & Walker – Fundamentals of Physics, 8th ed. (two copies are on reserve in the Noyce Science Library). Older (or newer) editions can be used, but be aware that homework questions will have different numbers. For the lab, you must purchase a bound, **quad–ruled** notebook, approximately 10" x 8," 60–80 pages. These are inexpensive and available at the college bookstore.

P–web: Please note that there is a **joint** PioneerWeb page for all three sections of PHY 131. The bulk of our course material, including assignments and solutions, will be posted on this PWeb page (I'll let you know if I post anything unique to our section). You are responsible for checking PWeb frequently.

Welcome to General Physics!
This is the first part of a yearlong introductory–level course in calculus–based physics designed to cover kinematics, the study of how things move, and mechanics, the study of the way matter and forces interact with each other. You'll learn how to use logical reasoning and mathematical analysis to apply physical principles, such as the conservation laws and Newton's laws, to a broad range of natural phenomena.

Like most skills, physics is best learned by doing. The course will include lecture and discussion, demonstrations, group activities and laboratory work. Your understanding of physics will be directly related to your participation in class exercises and discussion and your active engagement in observation and experimentation. You are expected to participate actively in the class sessions at all times.

Course Goals and Objectives
Developing your ability to understand, work with, and predict the outcome of physical phenomena ("do physics") and your ability to analyze the universe through a scientific framework is the work of a lifetime. In this course, you will grow in both those ways. By its conclusion, I expect you to have improved your

- knowledge and understanding of physical principals
- ability to recognize which physical principles (and their related equations) underlie specific situations
- ability to calculate the outcome of a situation from the relevant physical principals

- use of the scientific method, including generating a hypothesis, following an experimental procedure, collecting data, interpreting the data, and communicating your work.

We will be applying the above skills specifically to the field of Newtonian Mechanics. Therefore, in addition to growing in each of the above ways, I expect you leave this class with the ability to:

- describe 1, 2, and 3-dimensional motion in terms of position, velocity, and acceleration
- translate between force and motion using Newton's Laws
- determine the kinetic energy, potential energy, linear momentum and angular momentum of a system
- know when the appropriate conservation laws apply and apply these laws to predict the behavior of a system
- mathematically describe harmonic motion and waves
- calculate thermodynamic properties of ideal gases

Course Mentor and Other Resources

We are fortunate to have science mentors assigned to our courses this fall. Chad Harper (harperch@grinnell.edu) will serve as the course mentor for section 1 and Sarah McCarthy (mccarthy3@grinnell.edu and Olek Yardas (yardasol@grinnell.edu) will both work with section 3. PHY 131 mentors run weekly help sessions as another way for you to get course assistance outside of lecture and lab. The times for these help sessions will be set up during the first week of class. Past students have benefited greatly from these sessions. I encourage you to attend regularly. If you feel you need extra assistance to succeed in this course, along with what is available during regularly scheduled help sessions and my office hours, please get in touch with Minna Mahlab (mahlab@grinnell.edu) at the Science Learning Center (Room 2807) or Susan Norris (norrissu@grinnell.edu) in the Math Lab (Room 2012).

Class Structure

PHY 131 meets six hours each week, three in the classroom and three in the lab. I expect the reading assignments to take about three hours a week, and the homework to take about three hours more. My approach to the classroom is as follows:

- You are required to read the associated textbook chapters before arriving in class. This gives you time to think about the material on your own. Class activities are designed to aid your understanding rather than impart basic information. The day before the Monday and Wednesday lectures, you'll complete a brief online questionnaire before 10 pm. The purpose of the questionnaire is to verify that you have finished the reading and to provide you with an opportunity to indicate areas of confusion that you would like to see addressed in lecture.

- During lecture, I will review the material *with an emphasis on areas that you indicated were the most challenging*. During lecture, we may consider several short multiple-choice questions designed to evaluate conceptual understanding. You can respond to these puzzles using clickers that will be distributed at the start of class. Your responses will allow me to decide in real time whether we should spend more time discussing the topic at hand, or if we should move on to the next one. Lectures will also be supplemented with in-class demonstrations, allowing you to see concepts of physics in action.

- I will occasionally have you work in small groups on class exercises. These may take the form of a printed tutorial that you can take with you, or sample problems that you work on a small whiteboard that can be shared with others.

Final Grade Criteria

Class Participation 5%

Without your participation, this class will not be a success. This is why I grade on participation. Students who receive an "A" in participation will do many of the following things:

- Attend class
- Ask questions (before, during, or after class)
- Answer questions (being correct is not important)
- Respond to in-class clicker questions
- Attempt in-class problems
- Work effectively and collegially with classmates.
- Use my office hours, course mentor sessions, Science Learning Center and the Math Lab as needed.

Reading 5%

To ensure that you have both read and thought about the text, two problems and a response question to the reading must be submitted over PWeb by 10 p.m. the night before the Monday and Wednesday lectures. Late reading quizzes will not be accepted.

Homework 10%

Homework problems will be assigned one week before their due date and are due at the beginning of class every Friday (except in exam weeks). Solutions will be posted Monday mornings. Late homework will not be accepted unless cleared with me in advance and with a very good excuse. These assignments give you an opportunity to further synthesize what you discover through in-class lecture and activities into a formal knowledge structure.

It is never acceptable to look up homework answers online. Feel free to talk over homework problems with your classmates (and me!) but make sure you do the problems yourself. If you are concerned that one of your answers may resemble your classmate's too closely, include the name of your study partner with a brief explanation when you submit your assignment.

There are two reasons why we assign homework on a regular basis. First and foremost, doing regular exercises right after class activities helps you clarify, retain and extend the concepts developed during in-class activities. The second reason is to help both you and me assess your progress in the course on a regular basis. Your homework is graded so that I can
give you continuous feedback. In addition to the "right answer," you are graded on the quality of your reasoning, so show all your work. I've been known to give full credit for a wrong answer when the reasoning and problem set-up were correct and **I will give no credit for a right answer with no work shown.**

Laboratory 15%
A weekly three-hour lab is required to successfully complete this course. **Absence from more than two lab sessions without providing a satisfactory excuse or making up the work will result in automatic failure of the course.** We will provide the lab instruction manual. You are expected to bring a 10" x 8" quad-ruled notebook, a pen or pencil, and a scientific calculator. During the lab you'll gain hands-on experience with concepts from the lectures. You should come to lab prepared, having read the lab handout ahead of time. You will use your lab notebook to keep an ongoing record of your activities. This notebook should describe your work in sufficient detail that someone else could replicate your experiment.

You are responsible for your own understanding of the lab material. Make sure you ask the questions you want answered. You are required to write up your work for each experiment. Please refer to your lab instructor for more information about the style, format and content of the lab.

Midterm Exams 45% (15% each) Final Exam 20%
There will be three non-cumulative in-class exams and a cumulative final exam. Questions and problems on the exams will be based on the presentations in class, the assigned homework and text readings, class exercises and material from the labs. Exams will be closed book, but I will provide you with a summary sheet of relevant equations and numerical constants. Missed exams cannot be made-up unless you have a planned absence related to religious observance or varsity competitions. You must notify me before the third week of the semester so that we can reschedule your exam. In case of emergency, please contact me as soon as possible and be prepared to provide documentation.

Code of Academic Honesty
Cheating and plagiarism will not be tolerated. This includes copying answers to homework assignments or exam questions, or using any unauthorized materials during the exam. Any technique that gains unfair advantage over other students is considered academically dishonest. If your work looks too similar to someone else's or too closely resembles something published (on paper or online), I will suspect cheating. I am required to bring such a matter to the attention of the Committee on Academic Standing, which will conduct a hearing, possibly affecting your final course grade. A

detailed description of the college's policy regarding academic honesty and what constitutes plagiarism can be found here: Grinnell College Academic Honesty. **You are absolutely responsible for reading and understanding this policy. See me if you have any questions.**

Accommodation for Disability

If you have a disability of any sort, please let me know early in the semester so that your learning needs may be appropriately met. You will also need to provide documentation to the Coordinator for Disability Resources, Autumn Wilke, x3702, 3rd floor of the Rosenfield Center. We want to do everything we can to make sure you are able to fully participate in this class.

Religious Holidays

Grinnell College offers alternative options to complete academic work for students who observe religious holy days. Please contact me within the first three weeks of the semester if you would like to discuss a specific instance that applies to you.

Grading

- Did you show all relevant work?
- Did you use appropriate units?
- Did you correctly identify the relevant physical processes?
- Are your results free of mathematical and graphical error?
- Are your conclusions logical?
- Are your work and results communicated clearly?

The course will be graded on an absolute scale, with the following letter grade assignments:

Grade	Percentage
A-, A	90 - 100%
B-, B, B+	78 - 89%
C, C+	66 - 77%
D	56 - 65%
F	55% and less

Course Schedule, PHY 131 , Fall 2017 (Check the class website for updates)

Date	Topic	Reading	Lab
8/25	Welcome, Measurement Review	Syllabus, Ch. 1	
8/28	1-D Motion	Ch. 2.1-2.6	Intro to Motion
8/30	Constant Acceleration, Free fall	Ch. 2.7-2.10	
9/1	Vector Review	Ch. 3	
9/4	Motion in 2 & 3-D	Ch. 4.1-4.4	Velocity &
9/6	Projectile Motion	Ch. 4.5-4.7	Acceleration
9/8	Circular Motion		
9/11	Force & Mass	Ch. 5.1-5.6	Projectile Motion
9/13	Newton's Second Law	Ch. 5.7-5.9	
9/15	Newton's Third Law		
9/18	Friction	Ch. 6.1-6.3	Forces & Motion
9/20	Circular Motion Revisited	Ch. 6.5, Ch. 13.1- -Ch. 13.4	
9/22	Other applications		
9/25	Kinetic Energy & Work	Ch. 7.1-7.5	Centripetal Force
9/27	**Exam 1**		
9/29	Work & Energy		
10/2	Work, Variable Force & Power	Ch. 7.6-7.9	Measurement
10/4	Potential Energy	Ch. 8.1-8.6	
10/6	Conservation of Energy		
10/9	Cons. of Energy (cont.)	Ch. 8.7-8.8, Ch. 13.6,13.8	None
10/11	Center of Mass	Ch. 9.1-9.6	
10/13	Conservation of Linear Momentum		
	FALL BREAK		
10/23	Collisions	Ch. 9.7-9.11	2-D Collisions (1)
10/25	Collisions (cont.)	Ch. 10.1-10.3-5(+review	
10/27	Rotational Motion	Ch. 3.8)	
10/30	Torque	Ch. 10.6-10.9	2-D Collisions (2)
11/1	Applications/Review		
11/3	**Exam 2**		
11/6	Conservation of Angular Momentum	Ch. 11.6-11.11	Moment of Inertia
11/8	Simple Harmonic Motion	Ch. 15.1-15.4	
11/10	SHM(continued)		
11/13	Pendulum	Ch. 15.5-15.6	Simple Pendulum
11/15	Describing Waves	Ch. 16.1-16.5	
11/17	Wave Interference		
11/20	Standing Waves	Ch. 16.9-16.10, 16.12-13	None
11/22	Standing Waves (cont.)		
11/24	**Thanksgiving Holidays**		
11/27	Density & Pressure	Ch. 14.1-14.5	Waves on a String
11/29	Fluids	Ch. 14.6-14.10	
12/1	**Exam 3**		
12/4	1st Law of Thermodynamics	Handout	Absolute Zero
12/6	Kinetic Theory of Gases	Handout	
12/8	Wrap-up		
12/14	**Section 1 Final Exam, Thursday**	**9 am - Noon**	
12/15	**Section 3 Final Exam, Thursday**	**9 am - Noon**	