

# Physics 102

## Introductory Physics II

Spring 2023 Syllabus, v1.0

<https://102.sahill.us>

MWF 10–10:50am in Peelle 207

*This two-semester course is an algebra-based survey of physics. Topics include mechanics, thermodynamics, electricity, magnetism, and modern physics. (Catalog)*

In this second semester, we will discuss oscillations, waves, optics, electricity, magnetism, and nuclear physics.

**Pre-requisite: PHYS 101** (Introductory Physics I)

*You are expected to be comfortable with solving algebraic equations and working with trigonometric functions, as well as the concepts of force and energy.*

**Co-requisite:** You must also be enrolled in one section of **PHYS 104**.

## The Instructor

Sam A. Hill (*she/her*)

Assistant Professor of Physics

*(Please call me Professor Hill)*

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**Office Extension:** x4578

**Phone/SMS:** (567) 343-2284

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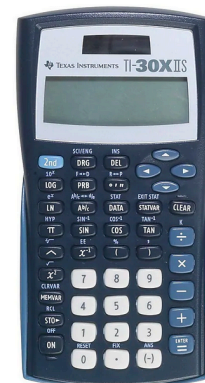
**Office:** Peelle 208



# Required Materials

The textbook for this class is *How Things Move, Why Things Move* by the instructor. This is a free online textbook which can be found at [howwhy.sahill.us](http://howwhy.sahill.us) or through the **Textbook** button on the class website. You can also refer to the free *College Physics* by Urone and Hinrichs (2012). at [openstax.org/details/books/college-physics](http://openstax.org/details/books/college-physics).

For use on exams at least, you must have a **scientific calculator** which has the trigonometric functions and scientific notation. It need not (but can) be a graphing calculator. Bring your calculator to all classes and exams. Needless to say, you may not share calculators during exams, or use a cell phone, laptop, or similar device during exams.



We will be doing online polls during class, so you will need access to a **computer, tablet, or phone.**

## Office Hours

Office hours are time I set aside in my schedule so that **you can come talk to me** with your questions and concern, and I encourage you to take advantage of the opportunity. Some office hours may be virtual-only, while others will be virtual or in-person at your discretion, although I do ask you to **wear a mask** in my office. You are welcome to drop by without an appointment, but if you email me I can be sure to be prepared for you.

Office hours will be chosen based on the outcome of the initial class survey, and will be announced on the class website. Any changes to the schedule will be indicated in the **News** tab.

# In the Classroom

Because I have written a textbook detailing the subject you should know, it would be redundant for me to repeat it in class. Therefore I will expect you to read the book before class: the reading assignments are listed later in this syllabus and in the **Reading** tab of the website.

During class,

- You can ask me about the reading.
- I will ask *you* questions about the reading, in the form of poll questions.
- I will do live demonstrations to help visualize aspects from the book.
- I will discuss and demonstrate problem-solving techniques.
- I will work through sample problems.
- You will work through sample problems alone or with other students.

## Polls

You will use an online polling platform to answer questions during class, which you can find by pressing the **Polls** button on the website. I will not grade your responses, but I will keep track of who participates in polls.

## Livestreaming

The class will be livestreamed, and can be accessed via the **Classroom** button on the website. In my experience students generally learn more when they attend in person, but if you are sick or otherwise unable to come to class, please consider this as an alternative to being absent. You can still participate in polls when you attend remotely. Recordings of the livestream will also be available online in the **Classes** tab; I encourage you to think of these as *review* and/or a last resource if you are forced to miss class.

You do not need to notify me when you will miss class, or ask permission, unless it will be for an extended period of time, or if it will cause you to miss an exam. Similarly, you do not need my permission to arrive late, leave early, or step out for a moment: just try to be discreet.

## **Tech Policy**

If you need to use your phone or tablet or computer during class for whatever reason, that's your prerogative. Just be polite about it.

## **COVID**

I plan to continue wearing a mask in the classroom this semester, and would ask you to wear a mask when visiting my office, so long as Lenawee County is at a Medium or higher risk. I will not require you to wear masks in the classroom, but I encourage you to do so especially when directly facing other students (during discussion for instance), or if you are unvaccinated. Long COVID is no joke, and while most COVID cases are mild and without lingering effect, it's not a lottery I care to engage in, and I would much rather see the virus go extinct for the sake of those with compromised immune systems.

# Homework

Homework will be assigned weekly on the class website, covering problems similar to those we looked at during the previous week. You may discuss the homework with other people but you must not copy down what other people write. Homework will be submitted electronically. Electronic submissions can be generated by writing out your solutions on a graphics tablet or touchscreen, or by writing them out on paper and taking photographs of them. Please be sure that your photos are readable and not too blurry before you submit them, and that the page fills the photo. **Please take one picture per page**; don't take a picture of multiple pages at once. You may either upload a PDF or a set of image files (which the website will combine into a PDF).

You should submit homework assignments and homework corrections directly from the Homework tab of the website, by pressing the corresponding grey button. You can request an extension by choosing a new due date from the pulldown menu and pressing the Request button that appears. The website will show you which assignments have been received.

✓: Submitted  
 □: Not submitted yet, not late  
 ✗: Not submitted, late

	Assignment	Corrections	The original assignment	Solutions available.	Click here to submit a correction	Due date for the correction.
	• ✓✓	Homework 1 (Solutions)	[Corrections]	due	Sat 1/2	⌵
	• ✓✗	Homework 2 (Solutions)	[Corrections]	due	Sun 1/3	⌵
	• ✗□	Homework 3 (Solutions)	[Half-Credit]	due	Tue 1/19	⌵
	• □□	Homework 4	[Submit]	due	Mon 1/11	⌵
			[Request]			

Click here to submit the assignment.

Due date for the original assignment.

If you didn't submit the original assignment, you can still submit the assignment for half-credit.

To request an **extension**, choose a new date from the pull-down menu and press the Request button.

# Homework Schedule

- Homework assignments will be posted on **Friday evenings**, and will cover material from that week's classes.
- I strongly encourage you to submit a **first draft** of your solutions on the following **Wednesday evening** through the class website. This will not be graded, but I will be reviewing your submissions on Thursday morning
- On that **Friday**, I will discuss the errors and misconceptions I saw in the first drafts, and answer your questions about the assignment. *Note that this will only work if most people submit first drafts.*
- Completed homework assignments will be due the following **Sunday evening** at 11:59pm through the class website. If you are happy with your first draft, you need do nothing more. If you submitted a first draft and you want to make changes, resubmit the assignment.
- The grades and solutions will be posted one week later. At that point, you are encouraged to review your assignment, and submit a **written reflection** on what you did wrong or misunderstood, and how you might do better to remember next time. (This is in lieu of the corrections system from last semester.) You may submit this as a text file (with a .txt extension) or as a PDF. Assignments accompanied by a written reflection will earn back half of the points that were originally lost.

# Homework Grading

## Grading Scheme

Every problem on the homework assignment is given a grade between 0–10:

Score	What it means	What it counts as
10	Completely correct.	100%
9	Correct except for one small error.	90%
8	Definitely on the right track, but there are some problems. (Or a correct answer is written down with no work shown, when you're told to show your work.)	80%
7	You wrote a few relevant things down but have a long way to go or are on the wrong track.	70%
6	You wrote one or two relevant things down.	60%
0	You left the problem empty or didn't write anything new.	0%

Once the homework is graded, you will be able to find your final score, as well as the grade for each question in the **Grades** tab of the website, as shown here.

- hw1: 94%  
a:1 b:1 c:0 d:1 e:1 f:0 g:1 h:0 i:0 1:10 2:9 3:10 4:9
- hw2: 98%  
a:1 b:1 c:1 d:1 e:1 f:1 1:8 2:9 3:10 4:9

# Extensions

The purpose of homework deadlines is to encourage you to keep current with the course material, to keep you from falling behind, and to allow me to post solutions in a timely manner without “spoiling” things for late submitters. That being said, everyone falls behind sometimes (as I will no doubt demonstrate myself), and so I maintain an *ask-and-you-shall-receive* extension policy: If you cannot complete an assignment before the due date, visit the Homework tab on the class website and choose a new date from the pulldown menu; all deadlines are at 11:59pm that evening. If you need a later extension than those shown, choose “Later” and then email me with the subject line “EXTENSION” explaining when you will turn the assignment in. (Please do not request short extensions via email.) You may ask for a second extension if required. Extensions should be requested *before* the assignment is due.

Note that **you must ask for an extension to get one**; do not just submit late work and expect full credit. Students cannot receive full credit once the solutions have been posted.

If you are unable to participate in class for an extended period of time (a week or more), notify me as soon as you can, so we can make alternative arrangements.

I reserve the right to limit your extensions if you abuse this policy. I will notify you by email should this become necessary.



# Exams

There will be two exams: a midterm somewhere around fall break, and a final exam. Exams will cover both concepts from the reading and problems from the homework, and will be a mixture of multiple choice, calculations, and short answer. A scientific calculator will be required. Details of the exam will come later.

# Grading

Your current grade will typically be available on the class website under the Grades tab; you will need to verify your identity through Google to see your grades. That tab will also show whether I have received particular assignments from you. I will do my best to keep the website up-to-date but it will often be a day or two behind at least, so don't panic if something doesn't appear there. If you want to know about a specific assignment, do let me know.

Grade Breakdown	
Homework	40%
Midterm	30%
Final	30%

This table shows the minimum percentage required to earn the corresponding letter grade. Grades will generally not be rounded. This is subject to change (in your favor only).

A	92%	B	82%	C	72%	D	62%
A-	90%	B-	80%	C-	70%	D-	60%
B+	87%	C+	77%	D+	67%		

## Grade Appeal Procedures

*"Students have 30 days after final grades are posted to submit an appeal for a final grade to an instructor. Appeals submitted after the 30 days may not be reviewed. Students should expect to provide supporting documentation for grade disputes. Students are required to follow the process below - the Academic Affairs's Office will not review a grade appeal until this procedure has been followed:*

- Email the instructor and request a review of your final grade.*
- If a resolution is not achieved with the instructor, the student should send their appeal to the department chair.*
- If a resolution is still not reached after speaking with the department chair, undergraduate students should contact the Assistant Dean of Academic Affairs; graduate students should contact the Dean of Graduate Studies. Students should expect to prove to the Assistant Dean or Dean of Graduate Studies that they reached out to the instructor no later than 30 days after final grades are posted.*

*If a grade change is warranted, it must be reported in writing by the instructor to the Registrar. The assignment of grades is the sole responsibility and prerogative of the instructor and will not be changed by chairpersons, Deans, the Registrar, or the Academic Status Review Committee." —Adrian College Academic Catalog*

# Academic Integrity

Cheating of any kind is a violation of the college's Academic Integrity Policy (See Student Handbook). The Assistant Dean of Student Affairs will be informed and it will be noted on the student's permanent record. A second offense may result in failure of the course.

- You are encouraged to discuss **homework** assignments with other students; however, your homework submissions must be in **your own words**. The best way to do this is to read the other person's work, understand it or take a few notes, and then put it away and write out the answer on your own. If two or more identical submissions come in I may give both assignments a zero.
- **Exams** must be done individually. In the event that exams must be taken remotely, you are not permitted to consult the Internet for information (other than the class website or other exceptions as may be noted on the exam), or to discuss the exam with any person other than the instructor, before the exam period is complete for everyone.

If you are feeling desperate enough to cheat, then please talk to me instead. It probably isn't as bad as you fear.

## **HLC Credit Hour Statement of Compliance**

*In accordance with federal regulations and mandates from the Higher Learning Commission in July 2013, Adrian College defines one credit hour as "A credit hour is the amount of work represented in intended learning outcomes and verified by evidence of student achievement that approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in (1) of this definition for other activities as established by the institution, including laboratory work, internships, practica, and studio work, and other academic work leading toward the award of credit hours." (Source: Federal Compliance Requirements for Institutions, June 2012, Higher Learning Commission: A Commission of the North Central Association)*

*As the majority of courses at Adrian College fall within a 15 week, scheduled class block the following is adopted as our assumptions for course work: 3 credit hour courses offered in a 15 week schedule consists of 3 hours/week of classroom instruction and 6 hours/week of out of class work (9 hours/week x 15 weeks = 135 hours of student effort).*

# Support

## Academic Accommodations

*Students with a documented disability may qualify for academic services. Please see me as soon as possible to make reasonable academic accommodations. Students with disabilities must self-advocate. You will need to provide recent, appropriate documentation, which verifies the need for reasonable academic accommodation. A copy of all documents is retained by Academic Services in Jones Hall. You may also reach Academic Services: [academicservices@adrian.edu](mailto:academicservices@adrian.edu).*

In many cases, I will be able to accommodate your needs without any documentation, and you will not need to prove or reveal anything to me other than what you need.

## Mental Health

If you want to come to class but you can't make yourself come to class, that's not laziness, but it may be anxiety, depression, ADHD, or another condition. If you need help along those lines, please feel free to contact me (or ask a friend to), and make an appointment with Counseling Services in the Student Health Center. See [adrian.edu/campus-life/health-counseling-center/counseling-services/](http://adrian.edu/campus-life/health-counseling-center/counseling-services/) for more details. **It's not your fault, and you deserve help.**

## Tutoring

Adrian College provides students with free tutoring, and usually does hire one or more tutors specifically for this class. To request a tutor or for more information, visit [adrian.edu/academics/academic-services/tutoring/](http://adrian.edu/academics/academic-services/tutoring/). The Math Lab on the second floor of Peelle may also be of help.

## Talk to Me!

If you run into difficulty with the material, if an unexpected emergency comes up which makes it hard to come to class or complete assignments, if you don't like the way I'm teaching: please tell me. I will do all that I can to help, within the framework of fairness to your fellow students. You pay me a lot of money; get the most of it. And remember,

**The earlier I know about a problem, the more I can do to help.**

# Ribbons of Excellence

As a physics class intended for students not majoring in physics, Introductory Physics does not presume to make mastery of physics its goal. You will learn numerous equations and techniques during this semester, but unless you continue to use them they will fade into the back of your mind.

Instead, the goal of this course is to learn how to **think critically** like a physicist. Physicists look at problems and break them down, distinguishing what is known from what is unknown. We extract the essence of complicated problems, creating simple models that capture the behavior we wish to investigate, while remaining cognizant of the simplifications our models introduce. We connect disparate ideas together in **creative** ways, combining notions of motion and force and energy to study all sorts of problems. The more ways we know how to think, the better we can understand the world and continue to **learn throughout our lifetime**.

Presumably none of you plan on majoring in physics (if you are, there's a different introductory class for that, PHYS 205). Instead you are all **crossing disciplines** by being here, whether it is for fun, for curiosity, or because your own degree program or career path recognizes the importance of a broad understanding of science.

Even if you don't use physics in your career, it will still be a valuable thing to understand as a citizen of a world facing so many dangers, particularly the ever-increasing risks of climate change. To survive as an industrial species we need to understand how the retention of solar energy in our atmosphere leads to the catastrophic effects we are already facing, and we must find better ways of creating, storing, and harnessing energy ourselves. As a voter you will be asked to choose between various plans and arguments, and a basic understanding of physics will leave you better equipped to **care for humanity and the world**.



# Learning Objectives

*On completion of this course, you should be able to...*

1. Identify from a written description what is known about a problem and what is being sought.
2. Choose and combine the appropriate equations to solve problems.
3. Describe and predict the behavior of select phenomena relating to ...
  - ...simple harmonic motion
  - ...travelling and standing waves
  - ...wave optics
  - ...ray optics
  - ...electric charges, fields, and potential
  - ...electric circuits
  - ...magnetic fields
  - ...electromagnetic induction
  - ...radioactive decay
4. Use ray tracing to find the location of images created by lenses and mirrors
5. Sketch the electric field lines created by a set of electric charges,
6. Interpret a set of electric field lines to determine the source charges present, and to find the force on another charge that is brought into the region,
7. Use Lenz's Law to predict the direction of induced current in a conducting loop.

<b><i>Physics Department Learning Objective</i></b>	<b><i>Corresponding Ribbons of Excellence</i></b>	<b><i>Course Learning Objectives</i></b>
<i>1. Know and use various problem-solving strategies</i>	<i>Thinking Critically. Developing Creativity.</i>	1,4-7
<i>2. Synthesize knowledge from different areas of physics.</i>	<i>Crossing boundaries.</i>	1-3
<i>6. Demonstrate knowledge of physics subjects.</i>	<i>Thinking Critically. Learning Through a Lifetime.</i>	3-7

# Tentative Calendar

Week	Date	Topic	Reading from Urone
<b>1</b>	1/9	Oscillations	16.1–16.5
<b>2–3</b>	1/16	Waves & Sound	16.9–16.11, 17.1–17.4
<b>4</b>	1/30	Wave Optics	27.1–27.6, 24.3
<b>5</b>	2/6	Geometric Optics	25.1–25.4
<b>6</b>	2/13	Images	25.6–25.7 26.1–26.2
<b>7</b>	2/20	MIDTERM	
		Electric Charge	18.1–18.3
<b>SPRING BREAK</b>			
<b>8</b>	3/6	Potential and Current	19.1–19.4, 20.1–20.4
<b>9</b>	3/13	Circuits	21.1–21.4, 19.5
<b>10–11</b>	3/20	Electric Field	18.4–18.7
<b>12</b>	4/3	Magnetism	22.1–22.9
<b>13</b>	4/10	Induction	23.1–23.3
<b>14</b>	4/17	Nuclear Physics	31.1–31.5
<b>15</b>	4/24	FINAL	

Material for the Midterm

Material for the Final