PHYS 151: Physics for Scientists and Engineers I!

Fall 2022

PHYS 151 team:	Daniel Sussman (Professor – daniel.m.sussman@emory.edu)
	Cory Donofrio (Lab leader – see separate Canvas page)
	Nandish Vora & Kristina Trifonova (PhysMentors)
Textbook:	*Physics for Scientists and Engineers*, Serway & Jewett, 10th Ed.
	(With WebAssign access; same text will be used for PHYS 152)
Lectures:	Monday & Wednesday, 11:30am - 12:45; *MSC Room E208*
Daniel's Office Hours:	Thursdays 11:00am - 1:00pm (*MSC Room N215*)
	Fridays 11:30am - 1:00pm (*MSC Room N215*)
PhysMentor Sessions:	Tuesday, 6:00pm - 8pm (Kristina – *MSC Room N215*)
	Thursday 6:00pm - 8pm (Nandish – *MSC Room N215*)

Course Objectives: Welcome to PHYS 151! This is an introductory physics course that covers the foundations of classical mechanics, waves and oscillations, and thermodynamics at a level appropriate for aspiring scientists and engineers (or anyone else who wants to learn more about how the physical world works!). By the end of the course, students will have acquired knowledge of fundamental physical concepts such as: velocity, acceleration, momentum, force and torque; energy and principles of conservation; fluids, waves and thermal physics. The course will move between abstract concepts and concrete applications, and students will become proficient in both applying physical concepts to specific situations and analyzing specific applications to uncover the most important physical concepts governing them.

But more than just acquiring knowledge and applying it in the clean setting of idealized homework and exam questions, my goal is that you will come away from this class knowing more about what it means to think like a physicist – combining *qualitative* and *quantitative* arguments to estimate how something will behave, thinking about *conserved* aspects of a system, thinking about *symmetry* and *scale*, and seeing the world with numbers attached. No matter what your background is or your future holds, a central value of a liberal arts education is being able to think from many different perspectives. An artist (for example) and a physicist might approach the same question in very different ways, and even if ultimately a physicist's approach doesn't resonate with you, I hope you'll walk away with an enriched perspective for understanding another way of seeing the world.

Textbook and homework platform: This course will follow, both in content and structure, Serway and Jewett's *Physics for Scientists and Engineers With Modern Physics,* 10th edition; we will additionally be using the WebAssign platform bundled with the text for our homework. You will also need the PHYS 151/152 lab manual; information on that can be found on the Lab Canvas site.

I'll be honest and say that I am uncomfortable at the price of modern textbooks, and this one is no exception. Fortunately, PHYS 152 in the spring will use the same textbook and homework platform, so you will only need to make this one purchase for your physics course for the year.

Course organization: This course has two components: Lecture and Lab, both of which must be passed to pass this class. For the lecture component, we will have two class meetings per week; assessment will be via homework (typically due every Monday), two midterm exams, and a final. I

will be using our Canvas page to organize the course, so that's where you will find material for the week, links to videos when I reference them, class discussion boards, and so on.

Cory Donofrio is our Lab Manager; please see the separate Canvas Page for all information about the Lab component of the class, and consult him if you have any questions about the weekly laboratory statistics lessons or homework that will be appearing on WebAssign.

Grading policy Your final grade in the course will consist of:

Homework	25%
Lab component	20%
Midterm 1	15%
Midterm 2	15%
Final exam	25%,

with letter grade ranges given by A (93.0-100), A- (90-92.9), B+ (87-89.9), B (83-86.9), B- (80-82.9), C+ (77-79.9), C (73-76.9), C- (70-72.9), D+ (67-69.9), D (60-66.9), and F (0-59.9 total, *or an F in Lab*).

This course will also implement what is sometimes called a "redemption clause," but which I like to think of as helping to align overall assessment with what you know by the end of the semester. Here it is: *Assuming you have passed the Lab section, your final letter grade will be assigned by taking the highest score of either (a) the combination of percentages listed above or (b) your final exam score.* Please do not rely on this: the final exam will not be easy, and it is a mistake to assume that some magic will happen on the final exam if you do not work hard and try to perform your best throughout the semester.

Weekly homework: I think homework assignments are a vital part of this course; I simply do not believe you can learn physics just from sitting through lectures. In this way, the need to *practice* physics makes the subject no different from most pursuits in life.

So, there will be an online homework assignment almost every week, due when class starts on Mondays. These assignments will be completed using the online WebAssign platform, and you should have received an Access Code for WebAssign with your textbook purchase. *No late submissions or after-the-fact requests for submissions will be accepted.* Rather than dealing with excuses on a case-by-case basis, I will instead simply drop the two lowest homework scores from the calculation of your course homework grade. I know that sometimes life happens. In the event of a disruption that spans multiple weeks of work, please see me individually.

Exams: All exams will be taken individually and in person. The dates of the midterms and final are listed in the Course Outline below, and if you know you will have a conflict with the midterms please contact me as soon as possible. These exams will be based on the lecture material, homework assignements, and textbook reading. Practice midterm exams will be given ahead of time – this course should be challenging, but I do not intend to surprise you by the content you are expected to have mastered.

Office Hours: My normal office hours for this class are listed at the top of this document, and I will have additional appointments available on a case-by-case basis if these times are incompatible with your schedule.

During regular office hours, you should feel free to stop by (no appointment necessary!). Most students use office hours to get additional help when they are struggling with the course material, want additional help with a tricky topic, or hope to clarify something they're not sure about. You

can also drop by to say "hi" and introduce yourself – this is a big class, and I'd be delighted to get to know you all! – to ask questions about the physics major or other programs of study, and so on.

PhysMentor Sessions: We are lucky to have two awesome upper-level undergraduates working as PhysMentors for this course! Once the semester gets going they will be holding weekly sessions – these will include reviews of the lecture material, discussions of the homework, additional worked examples, as so on. You'll have the opportunity to work in groups on physics problems, discuss course content, or delve more deeply into whatever physics issues you'd like. These sessions are attendance-optional, but I **strongly** encourage them – Nandish and Kristina are great, and it'll be fun to learn with them! These sessions will be help from 6pm-8pm on Tuesdays and Thursdays, starting during the second week of class (i.e., beginning on of August 30), in a location TBD.

Communication and feedback: I will respond to emails within 24 hours of receipt during the week; during the weekend I have family commitments (i.e., I have an adorable baby that I want to spend time with!) and will respond more slowly. I welcome (and during the semester I will seek out) feedback from you all about how the class is going and how I can improve the classroom experience. Email is a great way to send any suggestions or comments (if you prefer to send anonymous feedback, feel free to use a temporary, disposable email address; just be sure to include PHYS151 in the subject line so it doesn't route to my spam folder). It is not a great way to ask questions about homework, or about course material – it's almost always easier to answer such questions with a blackboard at hand, so I encourage you to take advantage of office hours for that.

Forms of address: I tend to be a fairly informal (and non-hierarchical) person when I communicate, both over email and in person. My preference is that you simply address me as "Daniel." If you are uncomfortable with being so informal then "Professor," "Prof. Sussman," or "Dr. Sussman" are all fine.

Similarly, I will by default address you by your full first name. If you have any other preference, or if I'm mispronouncing your name, just let me know! I believe people have the right to be called and addressed as they'd like; it seems like a pretty basic and straightforward type of respect to show to each other. Oh, speaking of: if you're wondering, my pronouns are he/him/his.

Academic Honesty: I expect you to exhibit the level of integrity and honesty that being a productive member of the physics research community requires. During the course of my own work I draw inspiration, evidence, and ideas from the work of others, I argue and counter-argue with them, and I believe the scientific product that results is the better for this type of engagement.

I expect you to mirror this level of engagement with the material in this class. In practical terms, I encourage you to **collaborate, form study groups, and discuss** homework with each other, but **you must** submit solutions yourself, and those solutions must reflect your own understanding of the problem and not that of one of your peers. You also **must not** simply seek out and use solutions to textbook problems from the internet, which would be a serious honor code violation.

Disability statement: As the instructor of this course I endeavor to provide an inclusive learning environment, and I want every student to succeed. The Department of Accessibility Services (DAS) works with students who have disabilities to provide reasonable accommodations, and it is your responsibility to request accommodations. In order to receive consideration for reasonable accommodations, you must register with the DAS. Accommodations cannot be retroactively applied so please contact DAS as early as possible; this will start a process in which we discuss the plan for implementing any specific accommodations.

For additional information about accessibility and accommodations, please contact the Depart-

ment of Accessibility Services at (404) 727-9877 or email accessibility@emory.edu.

Equal opportunity/non-discrimination statement: As the instructor of this class, I am committed to upholding Emory's principles and policies regarding equal opportunity and nondiscrimination. Emory University is dedicated to providing equal opportunities to all individuals regardless of race, color, religion, ethnic or national origin, gender, genetic information, age, disability, sexual orientation, gender identity, gender expression, and veteran's status. Please contact me with any questions or concerns related to these policies, which can be found here: http://policies.emory.edu/1.3

That feels like boilerplate, so let me be clear: I believe that physics is for everyone, and that treating everybody equally and with fundamental respect is a core human value. If you have any concerns about what is going on, want to talk about anything, or if you feel that *I* am not living up to my own standard here, please don't hesitate to come to me. You can also contact the chair of the department (Dr. Stefan Boettcher) or the department's Director of Undergraduate Studeies (Dr. Tom Bing) if you feel more comfortable talking to someone completely outside the context of this course.

Course Outline:

The following is a timeline of the material we will be covering throughout the course, and important dates for breaks and exams. During each lecture I will focus on core/important/difficult concepts, and it is your responsibility to do the reading in parallel*.

Date	Topic	Textbook reading
Aug 24	Introduction; 1D Motion (part 1)	2.1-2.4
Aug 29	1D motion (part 2)	2.5-2.9
Aug 31	Vectors; 2D Motion (part 1)	Chapter 3; 4.1-4.2
Sep 5	**Labor Day! No class!**	
Sep 7	2D Motion (part 2)	4.3-4.6
Sep 12	Newton's Laws (part 1)	5.1-5.4
Sep 14	Newton's Laws (part 2)	5.5-5.8
Sep 19	Newton's Laws and circular motion	6.1-6.2
Sep 21	Energy of a system (part 1)	7.1-7.6
Sep 26	Energy of a system (part 2)	7.5 - 7.9; 8.2,
Sep 28	Energy of a system (part 3)	Chapter 8

*One of my college professors used to say "The second time you see the same material – whether that's first from the textbook and then from me or vice versa – you'll think that source is a genius." In that context... well, selfishly, I'd prefer if you read the textbook before coming to class. But either way, as long as you learn the material, I'll be happy.

Oct 3	*Review for midterm 1*	
Oct 5	**Exam 1**	**Chapters 2-8**
Oct 10	**Fall break! No class!**	
Oct 12	Linear momentum (part 1)	9.1-9.4
Oct 17	Linear momentum (part 2)	9.5-9.8
Oct 19	Rotations (part 1)	10.1-10.5; 10.7-10.8
Oct 24	Rotations (part 2)	10.6 & 10.9
Oct 26	Rotations (part 3); Static equilibrium	11.1-11.4; 12.1-12.3
Oct 31	Universal gravitation	Chapter 13
Nov 2	Fluid mechanics (*A recorded lecture will be posted*)	14.1-14.6
Nov 7	*Review for midterm 2*	
Nov 9	**Exam 2**	**Chapters 9-14**
Nov 14	Oscillatory motion	15.1-15.5
Nov 16	Waves (part 1)	16.1-16.3; 16.5-16.9
Nov 21	Waves (part 2)	17.1-17.7
Nov 23	**Thanksgiving break! No class!**	
Nov 28	The "zeroth" law of thermodynamics	Chapter 18
Nov 30	The first law of thermodynamics	Chapter 19
Dec 5	The second law of the thermodynamics	Chapter 21
Dec 12	**Final Exam**	**Comprehensive**