Physics 110, Mechanics and Relativity

Instructors:

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Class Meetings: The course is a combination of two regular components.

- **Lectures:** We will meet in Wright 201 at 9am on Mondays, Wednesdays, and Fridays. These meetings will mostly consist of standard lectures. But on occasional Fridays, we'll have members of the department give presentations about their research. These guest lectures will be informal and largely disconnected from the course material, but they're usually a fun change of pace. Also, you should be warned that you may be asked at some point to say a few words about what you learned in them.
- **Workshops:** In addition to the lectures, you should also be registered for a lab/workshop section (numbered 2,3,4,5 by the registrar). Each section will meet twice per week, either on Mondays and Wednesdays, or on Tuesdays and Thursdays, in Wright 107. The general game plan (though there will be a bit of variation) is that the Monday/Tuesday meetings will be "workshops" where we go over the week's material in a more interactive way, solve example problems, talk about the week's homework problems, etc. On the Wednesday/Thursday meetings we will usually do labs.
- **OWLS Sessions:** This year, for the first time, we are supplementing our regular meetings for ph110 with *Oberlin Workshop and Learning Sessions*. These sessions will be overseen by two past ph110 students, **Stella Ocker** and **Rose Rosenthal**. The sessions will involve further discussion of the lecture material, example problems, and likely some amount of homework discussion in a highly interactive and informal environment. Attendance at these sessions is **completely optional**, but with all the abstract concepts we will deal with in this class, it is often useful to get as many perspectives as possible, so I highly encourage you to attend if you have the time. Meetings will be held in **Wright 209** on **Sundays at 8pm** and **Tuesdays at 7pm**.

Office Hours: I (Rob), will happily stick around for an hour or more after the Monday lectures, 10-11am, in or near my office (Wright 210, just down the hall from the lecture room). You're also always welcome to email me to make an appointment.

Course Overview: Most of this course will focus on the physics of everyday experience, the most familiar and readily apparent aspects of how the universe unfolds around us. The word *mechanics* is an enlightenment-era code word for the fact that (as far as we can tell) we are able to give a coherent order to our experiences by thinking of the entire universe as a structured *machine*. The levers and gears in this machine are things like mass, inertia, momentum, force, energy... We will study these concepts in detail, to better understand the workings of the universe that we see.

Near the end of the term, we'll also spend some time talking about *relativity*. Relativity is an ancient concept, but when we as physicists talk about it, we're generally referring to Einstein's *Special Theory of Relativity*, which describes the structure of space and time as best we currently understand it (unless there are gravitational fields around, in which case one has to move up to the more sophisticated world of *general relativity*, which we will touch on very briefly). Einstein's relativity is *not* the physics of everyday experience, as we will see in vivid detail, but it is far more accurate, and far more logically consistent, than the naive picture of space and time that we naturally develop through ordinary experience.

Textbook:

- **Fundamentals of Physics, Tenth Edition**, by Halliday, Resnick, and Walker

  This is the standard textbook for this type of class, and it's pretty good. We'll follow the textbook pretty closely (though not exactly in order), and most of our homework problems will come directly out of this book. Also, if you plan to continue on to physics 111 after this class, then this will also be the textbook for that class.

  One apology is in order: apparently there was a mixup with the textbook order, so the Oberlin bookstore will likely not have the book in stock until the end of the week, or even perhaps slightly later. I'm sure the book can be found at the other usual sources, but I will also scan the first few chapters of material and post it to the course Blackboard page so that you have them until your book arrives.

iclickers: During lectures, I will frequently ask simple multiple-choice questions to gauge the understanding of various concepts. You'll respond to these questions using a little device called an iclicker. You don't need to buy one. The physics department owns a large number of these clickers, and they're currently available at the science library. Simply go to the main desk of the science library and tell them that you're a student in physics 110 and that you need a clicker and they'll check one out to you for the semester. Once you have your clicker, send an email to `rowen@oberlin.edu` with the eight-character ID code from the back of the clicker. In this email, please also note that you are in physics 110 (I have students using clickers in another class this year, so I want to make sure I get you all in the right list).

Warning: If you need to replace the batteries in your clicker, *use Energizer batteries*. This is not a marketing scheme (at least not on our part). The battery compartments in the clickers are poorly designed, and many kinds of batteries don't always fit properly. The only brand that we've found to consistently work in the clickers is Energizer.

Assignments: Problem sets will be distributed in class on **Wednesdays** and due at the beginning of class on the following Wednesday (with one or two possible exceptions that will be noted clearly when the time comes). You may miss/drop one problem set over the course of the semester. Do not ask for extensions.

Exams: There will be two in-class midterm exams, on **September 28** and **November 9**, and an in-class final exam on the date specified by the registrar, **Wednesday, December 14, 2pm**.

Grading Policy: The midterms will each constitute 15% of your final grade. The final exam, 20%. The problem sets 25%. Another 5% will be determined by the number of responses you give (correct or otherwise) to the clicker questions.

Workshop/lab grade: The remaining 20% of your grade in ph110 will be determined by your workshop/lab instructor, based in part on general participation in these sections, and in part on two **lab reports** that you'll turn in over the course of the semester. The first will be due **October 10**, the second will be due on **December 5** (the Monday of the last week of classes).

Honor Code: Oberlin students are bound by the honor code. Details of the honor code are located at `http://new.oberlin.edu/students/policies/honor`. You are encouraged to work together on homework sets as long as you personally prepare and understand everything you hand in. Use of solutions found online or through other means is not permitted. No collaboration is allowed on the exams. Please write and sign the honor pledge on all materials you turn in. The honor pledge reads: "I affirm that I have adhered to the Honor Code in this assignment."

Services for Students with Disabilities: Students who have disabilities that may require accommodations in this course should let me know and contact the Office of Disability Services (Peters Hall G27/28, x55588) so that appropriate accommodations can be made.

Tentative Schedule:

Dates:	**Topics:**	**Lab:**
Aug. 29–Sept. 2	Introduction, Measurement	Estimation problems
Sept. 5–9	Kinematics in one dimension	Bouncing ball
Sept. 12–16	Vectors, motion in 2-d, circular motion	Car jump
Sept. 19–23	Force and motion	Accelerating carts
Sept. 26–30	More on Forces **— Midterm Exam Wed. Sept. 28 in Lecture**	Terminal velocity
Oct. 3–7	Kinetic Energy and Work	Carts and energy
Oct. 10–14	Potential energy, conservation of energy **— Lab report due Mon. Oct. 10 in WS**	Pendulum Challenge!
Oct. 17–21	**Fall Break**	Yaaayyyy!
Oct. 24–28	Gravitation	Bicycle gears and cons. energy
Oct. 31–Nov. 4	Simple Harmonic Motion	Simple Harmonic Motion
Nov. 7–11	Center of Mass, cons. of momentum **— Midterm Exam Wed. Nov. 9 in Lecture**	Collisions
Nov. 14–18	Rotation	Torque and Gyroscopes
Nov. 21–23	Relativity	**Thanksgiving Break Nov. 24-25**
Nov. 28–Dec. 2	Relativity	Relativity Paradoxes
Dec. 5–9	Relativity **— Lab report due Mon. Dec. 5 in WS**	More relativity problems
	— Final Exam Wednesday Dec. 14, 2-4pm —	