Introduction to Physics 2

PHYS 0111, section **10567**, **2014 Fall Term** (2151)

Lecture room: **343 Alumni Hall (except on Oct. 1, 3 at AUD6 Scaife)**
Meeting time: **Monday, Wednesday, Friday 1:00−1:50pm**
Instructor: **Prof. Tao Han**
Email: than@pitt.edu (preferred means of contact)
Phone: 412-624-2763
Office: Allen Hall 420B
Office hours: immediately after the lectures, or by appointment.

TA's contact information: **Daniel Wiegand (dmw88@pitt.edu).**

Course description and goals

This *3-credit* course is the second half of a two-term (0110, 0111) algebra-based sequence that presents the fundamentals of both classical and modern physics. The distinctive character of physics is that a few fundamental principles allow us to quantitatively understand a wide range (if not all) of natural phenomena. Physiological and biological processes also obey physical principles, and current medical technology is rooted in techniques from various branches of Physics. In this course, you will learn:

- general properties of waves; sound waves;
- electrostatics: electric charge, force, field, potential;
- magnetostatics: magnetic forces and fields;
- simple circuits;
- electromagnetic induction;
- electromagnetic waves;
- geometrical optics: reflection and refraction of light;
- wave optics: interference and diffraction of light;
- basic quantum phenomena, atomic physics.

The primary goal of this course is to make you understand the main physical principles and their far-reaching connections across disciplinary boundaries, and apply them to solving problems. You should come equipped with algebra and basic trigonometry. Other mathematical tools might also be sparingly introduced during the term, focusing on their applications.

Website

The *Courseweb* (`http://courseweb.pitt.edu/`) site for this course may be accessed using your Pitt e-mail username and password (if you forgot either, contact the help desk at 412-624-4357). Important announcements, lecture slides and additional materials will be posted and updated over there. Occasional announcements will be sent to you via email to your pitt address, so you are responsible for properly setting up mail forwarding from your Pitt mailbox in case you use a non-Pitt e-mail address.

Textbook

The textbook is *Physics, 9th Edition* by John D. Cutnell and Kenneth W. Johnson, ISBN 978-0470879528. However, the material will not always be presented in the same style as in this textbook. Additional readings will be assigned through the "Lecture documents" page on Courseweb.

Lectures

In lectures, your instructor will first introduce new concepts to you, at the pace of multiple concepts a week. It is highly recommended that you **do the assigned reading before each lecture**: you will benefit much more from the lectures and have an easier time keeping up with the pace if you have already tried to process at least some of the information on your own.
Lectures will be conducted in an **interactive** fashion, and the instructor will very often trigger **discussions** about physical phenomena with and among students. You will use hand-held radio transmitters (*clickers*) to answer the multiple choice questions posed by the instructor.
Each numbered clicker (stored in a bin on a cart near either classroom entrance) is uniquely assigned to a student, from beginning to end of the term. For your instructor, clickers have the two main functions of facilitating in-class discussions and giving a measure of the collective (not individual!) depth of understanding of a given concept. Mere attendance is not graded, but effective participation to in-class discussions will be rewarded with *extra credit* in a measure strongly dependent on the correctness of your recorded answers (see Extra credit).
As a courtesy to your classmates and instructor, you should come to class on time. If *at the beginning* of a lecture you cannot find your own clicker, even after searching in nearby bins, please proceed to your seat and notify the instructor only *after* the lecture, to avoid disruptions. You **cannot** under any circumstance **pick up a clicker not assigned to you**. At the end of every lecture, you **will return your clicker to its bin**. If you fail to do so, disciplinary actions may be taken unless you promptly return the device to the classroom. Malfunction of a clicker is an extremely rare event: allegations of malfunction during a lecture will be promptly verified by the staff if made immediately after the lecture, but ignored if made at any later time.

Classroom recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

Recitations

Recitations will be given weekly by a teaching assistant: **Daniel Wiegand (dmw88@pitt.edu).** You are expected to participate actively in all recitations. For part of the recitation, the class will be broken down into **small groups**, which will collaborate on the solution of a short problem on material that was recently covered in lecture. All group members are expected to significantly contribute to the assignment. You will be asked to turn in a clearly commented solution not to exceed a page in length, then be given a brief individual quiz on the same concepts.
Your recitation score will be made for 50% of the workgroup score and for 50% of the individual quiz score. At the end of the term, your **lowest score** on group assignment and individual quiz **will be** separately **dropped**. The recitation score thus obtained will be worth 10% of your course grade (see Grading).
There will be no individual makeup assignments. If you anticipate an inevitable schedule conflict with a specific recitation meeting, communicate that to your teaching assistant or instructor as soon as possible and you *may* be allowed to sit at a different recitation meeting in the *same* week.

Homework

Homework means applying the concepts you have learned in class and from the book and revised in recitation, so it is a key part of your learning process. Problems will be assigned online **every week**, typically on **Wednesdays,** through WebAssign[1] (`http://www.webassign.net/`) and will always be due a week after on **Fridays at 11:59 pm,** unless announced otherwise by the instructor. Each problem in WebAssign is generated uniquely for each student, so the problems assigned to you will be similar but not identical to those assigned to another student in your class. Collaboration with classmates is encouraged, but eventually you are expected to set up and solve every problem individually. Copying another student's answers, besides any ethical considerations, results in actually learning very little, hence performing very poorly at exams.
Extensions of up to 48 hours may be requested through WebAssign itself. They will be granted only if the request was sent before the regular due date, and a point deduction for late submission not to exceed 20% of the maximum score will be applied. The total homework score, after dropping the single lowest score, will be worth 20% of your course grade.

Help resources

TA's weekly office hours: Friday 9:00−11:00am, 509 Allen Hall. Any special need, contact the TA or me.
The Department of Physics and Astronomy maintains a freely accessible *Physics Help Room* at Thaw Hall 312, where teaching assistants will answer homework related questions, explain basic concepts, and help you with the math involved in solving problems. Since each new concept builds on earlier ones, it is critical to keep current with the class. If you realize you are getting behind, you should seek help either from your instructor or the TA **immediately**.

[1] **WebAssign set up:** From the home page `http://www.webassign.net/`, select PHYS 0111, section 10567, hit "I have a Class Key", type class key `pitt 0931 4469`, and follow screen prompts to set up your account. Within 14 days of the first login, you will have to opt for purchasing either the homework-only account for $44.95 or the homework system plus the electronic version of the textbook for $89.70. Instructions are also at the "Course Documents" page on Courseweb.

Exams and related policies

There will be two midterm exams during the term, each worth 20% of the course grade, and a cumulative final exam worth 30% of the course grade (see Grading). Exams will typically contain a mix of conceptual questions and short numerical problems. You will be allowed a self-compiled formula sheet not to exceed a single side of a letter-size (8.5 in. by 11 in.) sheet on the midterm exams, and not to exceed three sides of a letter-size sheet on the final exam. The average difficulty of exam questions at the exams should be similar to that of the more difficult problems from your homework assignments and examples that were worked out in class and recitation.

A missed exam will result in a zero score. If a **medical emergency** (or serious condition) occurs on (or persists through) the date of an exam, the student must communicate the situation to the instructor **within 24 hours** of the end time of that exam, and he/she *may* be excused by bringing a signed physician note certifying the inability of that student to do any schoolwork on that date. Other kinds of emergencies or truly exceptional circumstances will be evaluated by the instructor on a case-by-case basis.

There will never be, under any circumstances, a makeup exam *after* the regular exam was missed. If a really inevitable schedule conflict is anticipated, the student must communicate that to the instructor as early as possible in the term, and reasonable accommodations *may* be sought. Last minute notice of a schedule conflict will make the student ineligible for accommodations.

Grading

The maximum total score due to all the components of your coursework is 1000 points. These will be broken down as in the following table:

Coursework component	**Weight**
Recitation (lowest score dropped)	100 (10%)
Homework (lowest score dropped)	200 (20%)
Midterm exam 1	200 (20%)
Midterm exam 2	200 (20%)
Final exam	300 (30%)

Your extra credit, which is up to 75 points (see Extra credit), will be added to your numerical score out of 1000 points at the end of the term. To ensure uniformity of evaluation among sections taught by different instructors, a guideline has been set by the Department of Physics and Astronomy. This guideline informs the instructor of the acceptable range for the number of A+ to B− grades relative to the total number of grades, A to F. The number of students in the range of A+ to B− is roughly about $40\% - 50\%$.

Extra credit and related policies

There will be three sources of extra credit. The first one is individual **reports on experiments** done at the *Physics Exploration Center* (Thaw Hall 311). Instructions and due dates for reports will be posted on the "Extra Credit labs" page on Courseweb. While experiments may be performed in practical collaboration with a partner, reports must be individual. To certify that you performed the experiment, the front page of the report **must be dated and signed by one of the Physics**

graduate students in the Physics Help Room (Thaw Hall 312). Your own signature is also required. To receive credit, you will have to return each report to your TA **strictly** by the due date posted on Courseweb. Experimental reports will be worth 10 points each, for a total of 50 points.
The second source is **clicker responses** during lectures. Every incorrect clicker answer will be given only 1/3 of the credit for a correct clicker answer, so this may be thought of as a measure of being focused on and up to date with the material, more than one of mere lecture attendance. Just to be clear on the use of data, collective clicker data (e.g. which fraction of the class chose which answer) will be constantly shown to me (and you) in class on the fly, whereas individual clicker data will be passed on to the instructor only at the very end of the term, after all your coursework has been graded. Clicker responses will be worth up to a total of 15 points.
The third and last one will be your **participation in** both first-week and last-week **surveys**. That will give you another 10 points of extra credit.

Academic integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the term will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity, available at:
`http://www.provost.pitt.edu/info/acguidelinespdf.pdf`.
In particular, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators. Violations of integrity guidelines by a student may result in an immediate zero score for an examination or a failing grade for the entire course, depending on the seriousness of the offense.

Students with disabilities

If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and Disability Resources and Services no later than the second week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services, call (412) 648-7890 (Voice or TTD) to schedule an appointment. The Disability Resources and Services office is located in 140 William Pitt Union on the Oakland campus.

Weekly schedule (maybe occasionally updated)

Week/Dates	**Planned content**
Week 1, Assigned reading	Cutnell & Johnson Chapter 16
Aug 25 (343 Alumni Hall)	Nature of waves
Aug 27	Nature of sound, human hearing
Aug 29	Doppler Effect, applications
Week 2, Assigned reading	Chapt. 17
Sept 1	**no class: happy Labor Day!**
Sept 3	Superposition, interference and diffraction of waves
Sept 5	Standing waves on a string
Week 3, Assigned reading	Chapts. 17,18
Sept 8	Standing waves in a air column, beats
Sept 10	Electric charges, conductor and insulator, Coulomb's Law
Sept 12	Electic field, filed lines
Week 4, Assigned reading	Chapts. 18,19
Sept 15	Gauss' Law, applications
Sept 17	Electric potential and potential energy
Sept 19	Capacitors and Dielectrics
Week 5, Assigned reading	Chapts. 20
Sep 22	Electromotive force, Ohm's Law
Sep 24	Electric power, alternating current
Sep 26	**Midterm 1, coverage weeks 1-4, Chapts. 16−19**
	Room: TBA
Week 6, Assigned reading	Chapt. 20
Sep 29	Resistors in series and in parallel
Oct 1(AUD6 Scaife)	circuits, internal resistance
Oct 3 (AUD6 Scaife)	Kirchhoff's Rules
Week 7, Assigned reading	Chapts. 20,21
Oct 6	capacitors in series and in parallel, RC circuits
Oct 8	Magnetic fields, force on a moving charge
Oct 10	Motion of a charged particle in magnetic field, mass spectrometer
Week 8, Assigned reading	Chapts. 21, 22
Oct 14 (makeup Oct 13)	Force and torque on a current
Oct 15	Magnetic fields produced by currents, Ampère's Law
Oct 17	Induced Emf and induced current, magnetic flux

Dates	**Planned content**
Week 9, Assigned reading	Chapts. 22, 23 (only Sec 23.4)
Oct 20	Faraday's Law, Lenz's Law
Oct 22	Inductance, transformers
Oct 24	Resonance in electric circuits (Chapt. 23.4)
Week 10, Assigned reading	Chapt. 24
Oct 27	Nature of electromagnetic waves, spectrum, the speed of light
Oct 29	Energy carried by E&M waves, intensity, power
Oct 31	The Doppler effect for E&M waves, polarization
Week 11, Assigned reading	Chapt. 25
Nov 3	Light ray, reflection of light, images by plane mirror and spherical mirrors
Nov 5	The mirror equation and the magnification
Nov 7	**Midterm 2, coverage weeks 5-10, Chapts. 20−24** **Room: TBA**
Week 12, Assigned reading	Chapt. 26
Nov 10	Refraction of light, total internal reflection, polarization
Nov 12	Dispersion, lenses, images, the human eye
Nov 14	Thin-lense equation, magnification
Week 13, Assigned reading	Chapt. 27
Nov 17	Interference, Young's double-slit experiment
Nov 19	thin-film interference, diffraction
Nov 21	Resolving power, grating
Week 14, Assigned reading	Chapt. 29
Nov 24	Wave-particle duality, black-body radiation
Nov 26	**no class, happy Thanksgiving!**
Nov 28	**no class, happy Thanksgiving!**
Week 15, Assigned reading	Chapts. 29, 30
Dec 1	Photons, photoelectric effect, wave nature of matter
Dec 3	Nuclear atom, hydrogen atom, line spectrum
Dec 5	The Pauli exclusion principle, periodic table
Week 16, Dec xx	**Final Exam, coverage accumulative whole semester** **Time and room TBA**