

SUNY Geneseo, Department of Physics and Astronomy
PHYS 101: The Science of Sound
Syllabus, Fall 2011

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Course Websites: <http://www.geneseo.edu/~mclean/Sound/> and in myCourses.

Sounds are all around us. Sound is one of the two main ways we experience our environment. Our ears may not reveal as much spatial detail as our eyes, but they are far more sensitive and can detect a much, much greater range of “colors.” Sound allows us to hear around corners, down the hall, and even through walls. In this course, we’ll explore what this sound stuff is: how do we create it and detect it, how do we interpret its richness, and how can we shape it.

Physics is all around us, too. The mention of introductory physics usually conjures up images of flying balls and orbiting planets. But objects (like balls and planets) really ought to share the stage with the other great physical model, that of waves. Like objects, waves permeate the physical world; the two models even intertwine, and reach their ultimate marriage in the bizarre world of quantum mechanics. The study of sound will provide us with a wonderful way to explore the behavior of waves.

I hope that you will also develop your understanding of how physicists and scientists approach the world around us. You’ll do that by learning to actually do physics, that is, to solve physics problems. You’ll need to flex your mathematical muscles a bit. You’ll have to pay close attention to some subtle distinctions that you might otherwise gloss over. If you do these things while keeping the “big picture” in mind, the payoff can be a deeper appreciation for how our universe is put together.

Learning Outcomes:

1. (*Nat. Sci. Gen. Ed.*) Demonstrate knowledge of the following aspects of the scientific method: scientific observation, hypothesis development, data gathering and analysis, evaluation of evidence.
2. (*Nat. Sci. Gen. Ed.*) Demonstrate understanding of and ability to apply scientific data, method, and models germane to [physics], ...
3. (*This course*) ... specifically: algebraic manipulation methods, graphical data methods, the interrelation between physical quantities, units related to sound, and Fourier analysis.
4. (*This course*) Demonstrate understanding of some of the physical workings of sound production (musical instruments, loudspeakers), and sound detection (ears, microphones), and sound propagation.

Times and places:

Lectures: in Newton 202, Mon., Wed., and Fri. 1:30–2:20pm
Final: in Newton 202 on Fri., Dec. 16, 12:00–3:00pm
Labs: in ISC 215 (old Greene), four sections each meet for 2 hrs, Wed. or Thu.
Planned office hours: Wed 9:30–11:30am, Thu 2:15–3:45pm; Fri 2:30–4:00pm

I am also available at other times; see the schedule on my web site. Just stop by my office, or if you want to ensure that I’ll be there, contact me by phone or email.

Required materials:

Textbook: *The Science of Sound*, 3rd edition, by Rossing, Moore, and Wheeler

Study Guide & Lab Manual: *The Sound of Physics*, by McLean

Calculator: A calculator that handles logarithms (“LOG” key). This need not be very expensive. You don’t need a graphing calculator for this course.

Required coursework (with fraction of final course grade):

23% Homework: Normally due at 6:00pm each Friday. The lowest score will be dropped.

23% Laboratory: An integral part of the course. If you miss your regular lab sessions, you **must** makeup the lab. See the beginning of the lab manual for details. A few topics will be only presented in laboratory (which will not be covered on Exams).

33% Exams: There will be 3 midterm exams, each 11% of the final grade, during Wednesday class periods.

21% Final Exam: Roughly 1/3 new material, like a 4th midterm, and 2/3 review of the main course topics.

Computer Based Homework:

Homework will be administered through CAPA, the “Computer Assisted Personalized Approach” system. You can access this either from the course’s main web page or directly at <<http://capa.geneseo.edu/>>. Most answers will be entered via the World Wide Web. A few problems must be handed in during class.

Note that if there is a system-wide problem with the network, due dates may be extended.

However, individual computer difficulties will not be accepted as excuses for non-completion of assignments; the public computing resources at Geneseo are sufficient.

General Comments:

If you need to return materials to me outside of class, your best option is to bring it to my office. Slide it under my door if I’m not in. Work that reaches me (in my hands) after the due date may still receive partial credit.

Although test scores may be scaled up during grading of each exam, there will be no overall “curve” for the course grades. See my web site for more details on my grading policy.

If you must miss an exam for a college-sanctioned reason, contact me **before** the exam. If you miss a test due to an emergency, contact me **as soon as possible** and **with documentation**.

Absences that don’t fall into the above categories will result in a zero for the missed work!

Help available:

Remember that one important function of homework is for you to monitor your progress. If you are having problems with the homework, it should serve as a warning to take immediate remedial action. If you find yourself getting into difficulties, **do something about it—fast!** The arithmetic of averages shows that you can’t afford to delay if you start to get into grade trouble.

There are several resources available to you if you need help.

- The Physics Learning Center, in ISC 214, is staffed by physics majors and free. Check the schedule at <<http://physics.geneseo.edu/~pogo/Tutors/Tutors.htm>>.
- Your lab instructors have office hours; they will be most helpful for lab-related material.
- I have regular office hours, and am happy to meet with you at other times as well.
- If you need help with math, you might find the Math Learning Center in 332 South Hall helpful. They have a web page at <<http://www.geneseo.edu/math/mlc>>.
- A list of potential tutors is usually assembled by the Physics Department secretary, to assist you in contacting them for individual help. The fee is determined by the individual tutor.

- SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional or learning disabilities. Students should consult with the Office of Disability Services (Tabitha Buggie-Hunt, 105D Erwin, tbuggieh@geneseo.edu) and their individual faculty regarding any needed accommodations as early as possible in the semester. Further information available at <<http://disability.geneseo.edu/>>.

Expected Schedule

WEEK OF...	LECTURE TOPICS	EXAM (on WED)	LAB (Wed or Thu)
Aug. 29	Proportions & Speed of Sound		1. Graphing and Uncertainty
Sept. 5 (only WF)	Vibrations		Video Analysis
12	Graphs and the Circle of Physics		2. Springs & SHM
19	Simple Harmonic Motion		3. SHM, Damped HM
26	Sound Timbre	Exam 1	4. Oscilloscope Usage
Oct. 3	Sound Intensity		7. Frequency Analysis I
10 (only WF)	Loudness		(NO LAB)
17	Sound Spectra		6. Loudness Measurements
24	Hearing	Exam 2	8. Frequency Analysis II
31	Microphones and Speakers		5. Ripple Tanks
Nov. 7	Voice & Speakers		9. Audio System Response
14	Waves		10. Waves on a String
21 (only M)	Standing Waves		(NO LAB)
28	Musical Scales	Exam 3	Waves in a Tube I
Dec. 5	Wind Instruments		Waves in a Tube II
12 (only M)	String Instruments		(NO LAB)
16 12:00 PM		Final Exam	