

Introduction to Musical Acoustics, Physics 108
Spring 2010
Tuesdays and Thursdays, 11:00 - 12:15
Regener Hall Room 103
Instructor: Prof. Patricia Henning

Course Philosophy

Many people are scared off by physics these days, which is a real shame, because physics is really just thinking about how things work. In this class, we'll look at: sound production, propagation (how it travels), and detection, as well as music and musical instruments, the human voice and hearing, and acoustics of the environment. Topics will include: general properties of sound, applications to musical instruments, the human ear, the human voice, room acoustics, electronic reproduction and synthesis of sound, harmonics, tone quality, pitch and musical scales.

This class will focus on the physical concepts of musical acoustics. There will be some lecturing and lecture demonstrations, computer simulations, guest speakers/instrumentalists, field trips, small group hands-on activities, and class discussions. Class time will focus on concepts, and making sure we all understand them. Reading the textbook is important for full understanding of the material, and I will let you know what to read as we go along. Also, homework questions will help you in understanding and studying the material, and illustrate the most important concepts.

Extra Help

I hope you will feel very free to come talk to me about any aspect of the course, and especially if you need a little extra help. There is CAPS (Center for Academic Program Support), and you're welcome to use that resource, but I've noticed that beyond the basic physics we'll be dealing with, the CAPS tutors don't necessarily have much experience with musical acoustics. So start the homeworks when they're assigned, and come to me with any questions you might have.

Office Hours

Tuesdays and Thursdays, 12:15 - 1:15, room 109, Regener Hall (phone 277-5911). If you would like to talk about any aspect of the course, and you can't make those times, we can make an appointment. By far, the best method for contacting me outside of class is email (henning@as.unm.edu). The second choice is by phone to my office (room 31; 277-3166) in the Physics and Astronomy building, which is located on the northeast corner of Lomas and Yale.

Required Text

Musical Acoustics, 3rd edition, by Donald Hall (Brooks/Cole Publishing).

The Lab (P108L) There is lab which goes along with this course, and although it is not required for the class, I do suggest you take it if you can (it is required for some majors). You can choose either of the two sections of the lab: Thursday morning, 9:00-10:50, or Thursday afternoon, 1:00

- 2:50. The lab gives you an opportunity to spend time exploring some of the major concepts in depth, and will solidify your understanding. The lab is not required for the class, but your major may require it, so be aware.

GROUND RULES

- The lectures and demos will be designed on the assumption that you've read the supporting material in the text beforehand. I'll let you know what to read as we go along. I will also assign homeworks in class. Homework will be collected at the beginning of class on the day it's due. So, you can see that it's very important that you come to class! History shows that students who cut class don't tend to be successful in this course.
- Your progress will be assessed through three in-class exams and the final, with each counting 20% of the grade. Tentative dates for the in-class exams: 11 February, 11 March, 15 April. The final will be held on Tuesday, 11 May (12:30 - 2:30). Also, I'll assign homework (20%). You may work together on the homework with other classmates - just be sure to write the names of your collaborators on your homework before you hand it in. I encourage you to form study- and work-groups - it's a great way to learn. However, each person must hand in his/her own homework to get credit, and show work for each problem.
- If, for some very valid reason, you need to miss an exam, the make-up will be an **oral exam**. No make-ups will be given unless arranged **before the exam**. No exceptions.

Prerequisites

There are no UNM prerequisites for the class, and I do realize that the vast majority of you will not suddenly become physics majors (although, if you want to, come talk to me!). One of the fun things about the class is that the students come from different backgrounds, many from the fine arts and the humanities. The class will be as non-mathematical as possible, but we do need to use some math to understand the concepts. So, math skills as required for admission to the University are assumed, and this level of math will be used in the homeworks and the exams. This includes reading graphs, and early algebra skills. We'll talk about logarithms in class as needed for decibels. You will want to bring your calculator with you to class. This is a great opportunity to refresh and augment your skills in a non-threatening (I hope) environment. Please come talk to me if you have concerns. Use your resources - office hours and fellow students are great places to get support as needed.

Optional Project

If you like, you may do a project on some aspect of acoustics which interests you. I would take the grade on your project, and substitute it for your lowest in-class exam grade in the computation of your final grade (you still need to take all the exams, though!). You can't replace the homework grade. The idea of the project is to do original work, looking into some concept that interests you in more depth than we have time for in class. This project can take one of the following forms:

Option 1: A 3-5 page typed report on a few of the hands-on projects from the book that you have carried out, and that weren't done in class. You could also do one of your own, as long as you clear it with me beforehand. Whether you need 2, 3, or 4 projects will depend on how involved each project is. You must discuss with me in advance.

Option 2: in addition, a 10-15 minute oral presentation of Option 1. I intend to schedule oral presentations during the last week of class.

Option 3: a 4-6 page typed report on some aspect of musical acoustics of interest to you. This should be based on at least 4 sources of information, at least two of which are beyond the textbook and the class. This can be related to your particular field, but must specifically contain physics or acoustics concepts. This may or may not contain a hands-on component. (Be careful not to plagiarize any of your sources.)

Option 4: a 10-15 minute oral presentation on some aspect of musical acoustics of interest to you, based on your written Option 3. This should include some sort of interesting demonstration, and should go beyond information included in the textbook. In past years, students have done presentations on instrumental acoustics, presentations on microphones, and room acoustics. We have had a lot of fun with this in the past, I hope you will let your creative side show!

You do not have to do this optional project, but if you think you might want to, you have to get your **project approved ahead of time by me**. The written part of the project will be due on Thursday, 22 April, and project proposals must be handed in for approval by Thursday, 1 April. Oral project presentations will be Tuesday, 4 May.