PHYSICS 108
MUSICAL ACOUSTICS
Spring 2013

Instructor: Prof. Patricia (Trish) Henning
Class Time: Tuesdays and Thursdays 11:00 – 12:15
Location: 103 Regener Hall
Office Hours: Tuesdays and Thursdays after class, in Regener Hall. Other times by appointment.
email: henning@as.unm.edu
Office: Room 1165, Physics and Astronomy Bldg. (corner of Lomas and Yale; see map at the end of this syllabus).
Text: Musical Acoustics, 3rd ed. by Donald Hall (required)

Course Philosophy: Some 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 and propagation (how it travels), with emphasis on 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, harmonics, tone quality, pitch, and musical scales.

There will be some lecturing and lecture demonstrations, computer simulations, small group hands-on activities, and class discussions. We will also have three special classes, with guest speakers and instrumentalists from other departments on campus. One will happen in our usual classroom, the topic will be Tuning and Temperament. Another will be a visit to the violin construction workshop on campus. The third will be held at St. John’s Episcopal Cathedral downtown, to see and hear the amazing organ, the largest in the state of New Mexico. During class time, we will focus on concepts, and making sure we all understanding them. Reading the textbook is important for understanding the material, and I will let you know what to read as we go along (the textbook is required). Also, homework will help you to understand the material, and will give you practice with the most important concepts.

The Lab (P108L): There is a 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. The lab meets 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. Again, the lab is not required for the class, you can take the
lecture alone if you want, but some majors do require it – so be aware of that in your particular case.

**Extra Help:** I know it can be intimidating to speak in a large class, but if you don't understand something, please ask! Chances are many people around you don't understand it either. Come to office hours or send an email if you prefer. Feel free to come to office hours if you want to chat about any acoustics-related topic. Also, there is CAPS (Center for Academic Program Support), and you’re encouraged to use that resource, especially for the physics we’ll talk about. CAPS tutors don’t necessarily have much experience specifically with musical acoustics, so always feel free to come to me with any questions you might have. Experience shows that students who come to me with questions about homework – before the homework is due – are always glad that they did! If you are busy during my office hours, just make an appointment, we can find another mutually agreeable time, I’m sure.

**A Word About Prerequisites:** There are no UNM prerequisites for this class, and I do realize that the vast majority of you are not science majors (though if you are interested in majoring in physics and astronomy, come talk to me!). One of the great things about this class is that 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 should bring your calculator to class, to use during the in-class activities. This is a great opportunity to refresh or augment your skills in a non-threatening (I hope) environment. Please come talk to me if you have concerns. Use your resources: office hours, CAPS, and fellow students are great places to get support as needed.

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**COURSE GROUND RULES AND GRADING**

**Reading.** The lectures and demos will be designed on the assumption that you’ve read the supporting reading in the text before class. I’ll let you know what to read as we go along.

**Homework.** I will assign homework in class, and all together the homework counts 20% of the grade. Homework will be collected at the beginning of class on the day it’s due. I encourage you to form study groups with classmates, and you certainly may work together on homework, but each person must hand in his/her own homework to get credit. Identical homeworks will earn zeroes. You need to hand in the homework on time to keep up in the class. To encourage this, I will give only half-credit for late homework handed in by the lecture after the due-date, and no credit after that. Please don’t email me your homework, you need to hand it in at the beginning of class, on the day it’s due.

**Exams.** Your progress will be assessed through three in-class exams, and a final exam, with each counting 20% of the grade. You will be allowed to bring one 3” x 5” note card to each exam,
which I’ll collect at the end of the exam (but they’re not graded). I will give you a blank card a few
days before each test. The tests are closed book.

Tentative schedule for exams: Thursday, 14 February, Thursday, 21 March, and Thursday, 18
April. The final exam will be Tuesday, 7 May, 12:30 – 2:30 PM. Put these important dates into
your calendar now. I will announce any changes.

Regarding grade disputes; if you feel your test grade is in error, please bring it to my attention no
later than 1 week after receiving your graded test.

Make-up tests. You may make up a test only if you have a valid excuse, which includes UNM
activities (eg. concerts or athletic events, with official note from the Music or Athletic department),
or illness with doctor’s note, AND YOU NOTIFY ME BEFORE THE TEST. You MUST make up
the test within ONE WEEK of the original test date. All make-ups will include an oral test. These
take place IN MY OFFICE, not in Regener (see map at the end of the syllabus).

The Optional Project: If you like, you may do a project on some aspect of acoustics which
interests you. As incentive, if you do a project, I will take the grade on your project and replace
your lowest in-class exam grade with it. You must still take all of the exams! I will not replace
either the final exam or homework grade. The idea of the project is for you 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, described below. For all options, you need to write up
a small proposal, and hand it in no later than Thursday, 28 March, so I can approve the projects
before you write them up. Also, some options involve a presentation in class. Regardless of
whether you do a presentation, all projects must contain written work, to be handed in on Tuesday,
23 April. Class presentations will be on Thursday, 25 April. I hope you will consider an optional
project, we have had some really creative projects in the past, and the presentations have been a lot
of fun.

Here are the options for the project:

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.

Option 2: In addition, a 10-15 minute oral presentation of your work in Option 1.

Option 3: A 4-6 page typed report on some aspect of 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 my
lectures. This can be related to your field or a hobby, but must contain physical 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, based on your written Option 3. This should include
some sort of interesting demonstration, and should go beyond information in the textbook. In past
years, students have done presentations on electronic music, instrumental acoustics (even building their own instruments out of things from hardware stores!), 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!

Jessica Kimmey's presentation file

You do not have to do an optional project, but if you think you might want to, feel free to come talk to me about it. All projects must be pre-approved. Again, the proposal deadline is Thursday, 28 March, the written part is due Tuesday, 23 April, and the oral presentations will be Thursday, 25 April.

Dr. Henning’s office hours are in Regener Hall (where the lecture is) but her “regular” office is in the Physics and Astronomy building, shown here.