

# PHYS 1240: Sound and Music

Spring 2020

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**Instructor:** Patricia Rankin

**Time:**

Tue/Thur 3:30pm-4:45pm

**Email:** [Patricia.Rankin@colorado.edu](mailto:Patricia.Rankin@colorado.edu)

**Location:**

Duane Physics G1B20

**Course Webpage:** <https://physicscourses.colorado.edu/phys1240>

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## Course Overview:

Physics 1240 (Sound and Music) is an introductory level 3-credit course designed for non-science students to explore the science of common phenomena in a way that grows both their understanding of the science and their appreciation of the world we inhabit. The goals of the course are as follows:

1. Gain a physical intuition for how sound works, including how it can be generated (instruments, speaking, synthesizers, etc.), transmitted (wave dynamics, room acoustics, etc.), and received (human ears, microphones, psychoacoustics, etc.)
2. Understand the quantitative description of sound properties such as intensity and frequency,
3. Explore how individual sounds can combine to form what we call music
4. Learn how scientific knowledge is based on direct physical observations that can be verified by any observer possessed of adequate skills and equipment, and to explain through examples what is meant by a scientific theory.
5. Discover how using science to understand how the world works enhances the enjoyment of a performance.

The course is taught by physics Professor Patricia Rankin. She is joined by the other members of the Physics 1240 learning team including Tyler McMaken, a graduate student and lecturer in the Department of Physics with degrees in both physics and music. There are three Learning Assistants (LAs) assigned to the team - Madeline Karr, Rishi Mayekar, and Miles Warnke. The team is large because there will be lots of opportunities for students to interact with the learning team inside and outside of the classroom (and class participation is essential for success in this course). The course consists of daily lectures interspersed with clicker questions, collaborative assignments (tutorials), science demos, and music demos (including student performances, if possible). In addition, there will be weekly on-line homework assignments due Wednesdays at 5pm (see [schedule](#) for details) and approximately every other week there will be Home Labs due Mondays at 5pm (see [schedule](#)). There will be a midterm exam held in class on Thursday 5<sup>th</sup> March and a final exam (Monday May 4<sup>th</sup> 1:30pm-4:00pm, location to be determined).

## Canvas

This course has a [Canvas site](#). It will be used for completing your weekly homework assignments and to view homework solutions, to upload your homelab assignments and view homelab solutions, for clicker solutions, and for exam solutions. You will also use the Canvas site to check your grades.

## Textbook

The textbook for this course is Principles of Musical Acoustics, by William Hartmann. Click [here](#) to download a copy (link only works on campus or with a [VPN connection](#) to campus). Always plan to do the reading assigned for the week before the classes for that week. If you do, you'll get more out of the classroom experience. Again, see the class [schedule](#) . We will not cover all of the material in each chapter, but you should read the entire chapter.

## Office Hours & Helproom:

Getting regular help is strongly correlated with success in this course. You can get valuable help from peers, and from the learning team members. Even at times members of the learning team are not available you can get help from the other people staffing the help room. The complete Help Room (Duane G2B90) schedule is [here](#). The 1240 teaching team will be in the help room at the times below and also available for remote help sessions (via skype, facetime, or zoom) which you can schedule during times set aside for these meetings.

- Professor Rankin will hold office hours on Tuesday from 11am -12pm in the Physics Help Room (Duane G2B90) to help with homework assignments, homelabs, and studying. She will also be available from 2pm-3pm Wednesdays in her office F331 in Gamow Tower or online. In addition, you can ask questions right after lecture at the front, or email at [Patricia.Rankin@colorado.edu](mailto:Patricia.Rankin@colorado.edu) (should receive a response within 24hrs)
- Tyler McMaken, will hold office hours on Mondays 1-2pm in the Physics Help Room and will be available Fridays (10am -4pm) online. He can be reached at [Tyler.McMaken@colorado.edu](mailto:Tyler.McMaken@colorado.edu) .
- Madeline Karr will hold office hours on Wednesdays from 4-5pm in the Physics Help Room and also be available online 6-7pm. She can be reached at [Maka4395@colorado.edu](mailto:Maka4395@colorado.edu) .
- Rishi Mayekar will hold office hours on Thursdays from 2:00-3:00pm in the Physics Help Room and also be available online Thursdays 11am -12noon. He can be reached at [Rima0630@colorado.edu](mailto:Rima0630@colorado.edu) .
- Miles Warnke will hold office hours on Thursdays 10am-11am in the Physics Help Room and also be available online Wednesdays 3pm-4pm. He can be reached at [Miwa0471@colorado.edu](mailto:Miwa0471@colorado.edu) .

## Prerequisites

Though no prior college courses are required for enrollment in this course, all students must have two units of high school algebra and one of geometry (in other words, you may not have a math MAPS deficiency). High school math will be used regularly, but the course will not use or develop any higher mathematics.

## Course Materials:

To help everyone stay engaged in the classroom, we will be using the [CUClickers](#) student response system. You must have a clicker and bring it to class every day. On each clicker question, you get one point for clicking and one point for giving the correct answer. We will start keeping track of clicker scores from the January 23<sup>rd</sup> class

onwards. You must [register your clicker](#) so we can associate the unique code programmed into your clicker with your name. Answers to the clicker questions will be posted on the Canvas site.

Other necessary materials for this course include a calculator capable of computing logarithms, sines, and cosines (used for exams, homework assignments, and in-class participation), a recording device (phones or laptop microphones do just fine), and access to [sound-analyzing software, which can be downloaded for free](#).

### **Homework**

There will be 12 weekly homework sets, due on Wednesdays at 5pm. You will use Canvas to do the homework problems. It is very important to solve and understand every problem yourself. On the other hand, it is also important to take advantage of the many sources of help available in this course. Limit yourself to verbal help; do not take any written information from others and do not make written notes when you talk to others. This will ensure that you think about the problems independently after you get help. Solutions to the homeworks will be posted on the Canvas site.

No late homeworks will be accepted since solutions will be posted soon after the deadline. All of your homework scores will be included in your point total for the course. If you feel that the event that caused you to miss the deadline is excusable contact Professor Rankin immediately by e-mail for consideration. Be sure that you go back and work any missed problems as soon as you can.

### **Homelabs**

You could never learn to play the piano just by reading a book, or by solving homework problems on music theory. Similarly, you can't expect to appreciate a scientific subject without direct experience with the phenomena in question. This course will include lab experiments that you can do at home with materials we provide (like plastic tubes and guitar strings), other readily available materials (tape, pencils), and a computer. The homelabs will be due as scheduled at 5pm on Mondays (before the first class of the week). You will complete your homelab assignments on paper and then upload a pdf file to a Canvas dropbox. Late homelabs will not be accepted. If you feel that the event that caused you to miss the deadline is excusable contact Professor Rankin immediately by e-mail for consideration. Most of the labs will involve creating sounds and then recording and analyzing them using the program Raven Lite (you will learn about this in homelab 1). You must have access to a computer or laptop with a microphone and with Raven Lite installed.

### **Exams**

The midterm exam will be in class on Thursday March 5<sup>th</sup>. The final exam has been scheduled by the registrar for Monday May 4<sup>th</sup> 1:30pm-4:00pm. (It will not be possible to take the final exam earlier.) The problems on the midterm and final will be similar to those on the weekly homeworks, except that you won't be using Canvas to enter your answers. There will also be one or more problems on the midterm and final related to the homelabs. At both exams you will be allowed to have one 8-1/2 x 11 sheet of paper with hand-written notes on both sides, and a calculator. To prepare for the exams, make sure that you can do all of the weekly homework problems with only your sheet of notes and a calculator, and that you understand the homelabs.

## Grading:

Your grade will be based 30% on the weekly homework, 20% on the homelabs, 20% on class participation (10% clickers, 10% tutorials), 10% on the midterm exam, and 20% on the final exam. Grades for all components of the course, including final grades, will be posted on the Canvas site.

Final letter grades will be assigned using a standard grading scheme with the following (inclusive) lower cutoffs, though this percentage scale may be slightly shifted at the instructor's discretion (but such a shift would only make final letter grades more favorable to students, never less favorable):

Lower cutoff	0%	55%	60%	65%	70%	73%	77%	80%	83%	87%	90%	94%
Letter grade	F	D–	D	D+	C–	C	C+	B–	B	B+	A–	A

## Incompletes:

Rules of the University require that grades of incomplete (I) may be assigned only if *“for reasons beyond the student’s control, the student is unable to complete the course requirements.”* “I” requests must be made in person to the instructor.

All campus policies will be followed. They are summarized below for your convenience., these include

### Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to Professor Rankin by January 31<sup>st</sup> so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671 or [dinfo@colorado.edu](mailto:dinfo@colorado.edu) for further assistance. If you have a temporary medical condition or injury, see [Temporary Medical Conditions](#) under the Students tab on the Disability Services website.

### CLASSROOM BEHAVIOR

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the policies on [classroom behavior](#) and the [Student Code of Conduct](#).

### PREFERRED STUDENT NAMES AND PRONOUNS

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns

are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

### **HONOR CODE**

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code ([honor@colorado.edu](mailto:honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the [Honor Code Office website](#).

### **SEXUAL MISCONDUCT, DISCRIMINATION, HARASSMENT AND/OR RELATED RETALIATION**

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, intimate partner abuse (including dating or domestic violence), stalking, or protected-class discrimination or harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or [cureport@colorado.edu](mailto:cureport@colorado.edu). Information about the OIEC, university policies, [anonymous reporting](#), and the campus resources can be found on the [OIEC website](#).

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

### **RELIGIOUS HOLIDAYS**

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please inform Professor Rankin by January 31<sup>st</sup> of any conflicts.

See the [campus policy regarding religious observances](#) for full details