University of Pittsburgh

Fall Term 2022-2023

Course title: ***Science of musical sounds***
Meeting time: *TuTh 1:00PM - 2:15PM*
Meeting place: *102 Thaw Hall*
Contact information: Dr. Matteo Broccio `[mbroccio]`, 217 Allen Hall.
Office hours: *in person/Zoom*, to be announced via Canvas.

Course description

This course introduces students to the physical ideas underlying musical phenomena. The topics that we will discuss in this course include: sound itself (propagation, interactions with acoustic environment); hearing; analysis of musical sound (loudness, pitch, timbre); dissonance and scientific basis of music theory; sound production (monopoles, resonators, membranes); musical instruments (winds, strings, voice); electronics in music, including synthesizers.

The basis for learning these concepts will be mainly through demonstration, rather than mathematical derivation, as this course is *not* restricted to science majors. You should be equipped with high-school level basic algebra and geometry, and any other tool will be carefully reviewed from scratch, focusing on its application.

The course is managed on Canvas, which you can access using your Pitt credentials (help desk: 412-624-4357). You are expected to check Canvas at least every other day. You will find practice material and feedback (including homework grades).

Lectures

At class meetings, you will be presented several *demonstrations and simulations* and sparse conceptual questions for the main purpose of getting feedback about your learning. Responses will not count toward your grade. I will often elicit discussions about what we hear and why, to expand your pre-existing experience with music as listeners (and for those of you who happen to play an instrument, as performers). Sense-making of the underlying conceptual physics is key to your learning, and your active participation is a stepping stone to your readiness to do your graded homework, which will first and foremost assess your conceptual understanding.

To ensure the free and open discussion of ideas, students may *not* independently record classroom lectures without the advance written permission of the instructor. Lecture notes will be posted within 12-18 hours after each class meeting, for your reference.

Textbook

Though I will not cover the topics in the same style or depth as this book, a very useful complementary resource to my lecture notes is *The Science of Sound* (3rd edition) by Rossing, Moore, and Wheeler. This book is available at Pitt Engineering library, on a first in first served basis. It will be particularly useful when it comes to technical definitions and formulas. No book purchase is formally required for this course.

Audio editor

The music theorist Aristoxenus of Tarentum stated that "the judgment of the ear is superior to the cogitations of mathematicians". Predictably, **audio files** will be an integral part of the material that you will be presented both in class and in your homework. I strongly recommend that you download and familarize yourself with the popular free audio editor *Audacity*. In case you do not have it already on your computer, here is the link for the download (Windows/Mac/Linux options). I will provide the necessary musical excerpts fo auditory analysis along the way. We may also use the graphical output of some web applets, for which you are not expected to download anything at all to your computer. Finally, I will keep my assumptions of technical competence at an absolute minimum, so nobody in the audience needs to be a computer geek to follow along.

Homework

You will be assigned homework via *Canvas* itself, *every week*, with the exception of the week of Thanksgiving week. Homework allows to independently verify your conceptual understanding and quantitative skills. Your collaboration with other classmates is *not* discouraged, but eventually you will need to genuinely know (not *think* you know) how to articulately answer a question of that same kind completely on your own. As for extensions, *every assignment will be automatically left open for four additional days past the regular due date, with a flat 10% deduction for late submission*. You will not need to send an email to request an extension within that frame; extension requests made *after* the 'late due date' will be altogether ignored. As a rule, there will be *no makeup* homework sets; at the end of the term, your *three* lowest percentage scores on the homework will be dropped.

In-class assessments

There will be *five word-type assessments*, dates to be confirmed in writing. These assessments will contain mainly conceptual questions and occasionally quantitative problems (average difficulty will be comparable to the problems provided via Canvas). I will be **unable to offer any makeup exam *after* a scheduled assessment was missed, regardless of the specific reason**. There is no final exam for this course, so your graded coursework will end the last week of classes. Your lowest two assessment scores will be dropped.

An unsubmitted assessment earns a zero score. If a *medical emergency* occurs, the student has the obligation to *communicate it via email to the instructor as soon as humanly possible*. In health-related situations, the student *may* be excused from a single exam by sending a signed physician note certifying his/her inability to perform schoolwork, and other kinds of emergencies will be evaluated on a case-by-case basis. If a chronic medical condition applies, the students is expected to have already contacted Disability Services about it, as outlined on the next page. In all the above cases, being excused means that the automatic zero score on the assessment will be dropped, so the exam grade will be determined by the remaining exam scores. Under no circumstances a student can miss two or more assessments. If you have questions about this policy, please do not hesitate to contact me sooner rather than later.

Help resources

Office hours. You surely are not alone in your learning process, but you will need to be proactive in seeking help. Consider coming to my weekly informal office hours, to help you check your conceptual understanding, especially of the physics and psychophysics aspects of the material.
Study Lab. At Pitt's Study Lab, undergraduate tutors are able Mon–Fri to virtually help you with mathematical difficulties of any kind. You will need to schedule an appointment directly with the Study Lab staff.

Grade calculation

Your numerical grade will be calculated using the weights shown in the following table.

Item in master course gradebook	**Weight, %**
Canvas participation (perusal of all material)	10%
After-class homework (*three lowest scores will be dropped*)	42%
In-class assessments (*two lowest scores will be dropped*)	48%

To give you an approximate idea, a total score of $\sim 93\%$ should be converted to an A; a total score of $\sim 83\%$ to a B; a total score of $\sim 73\%$ to a C. This may undergo small adjustments, and the cutoffs for "+" and "-" grades will be determined accordingly. The official letter grade cutoffs will be posted on Canvas close to the last week of classes. Unless a manual entry error in the gradebook or a miscalculation was made, your final letter grade is *not* subject to appeal.

Academic integrity policy

All students 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, publicly available at:
`http://www.provost.pitt.edu/info/acguidelinespdf.pdf`.

Accommodations

If you have a disability requiring special testing accommodations or other classroom modifications, you need to notify both the instructor and Disability Resources and Services no later than two weeks into the semester. You will be asked to provide documentation of your disability to determine the appropriateness of accommodations, which will not be shared with your instructor – your instructor will be notified of the assessment outcomes in terms of practical accommodations. To notify Disability Resources and Services, call (412) 648-7890 or send an email to `drsrecep@pitt.edu` to schedule an appointment. The Disability Resources and Services office is located in 140 William Pitt Union on the Oakland campus. Feel free to reach out to me with an email if you have doubts or concerns in this area: I will be happy to help.

Updates to policies

Updates to any of the information contained in this document will have to be announced *directly by me* both in the classroom and through Canvas to be in effect. When in doubt, it is always safer to ask your instructor than to make assumptions. Thanks for reading.