PHYS 2278
Bennington College
Spring 2026

The Physics of Sound

(2 credits)

Class Time: Tuesdays 8:30am – 12:10pm (2nd 7 weeks)

Me
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Office Hours: Wednesday 9:30-11am & Thursday 1:00-2:30pm, ***or by appointment***

Text: *Physics and Music: The Science of Musical Sound,* by H.E. White & D.H. White

Course Homepage: Course material will be posted at http://crowl.bennington.edu/sound/ Make sure to regularly check our course page there to ensure you get all of the relevant information.

Course Overview: Physically, sound is simply the compression of air around us. However, this relatively simply description obscures a much richer understanding of sound. From how different sounds are generated and perceived to how different sounds can combine to make something new to how to design acoustically pleasant spaces, the physics of sound plays a key role. This course is about the fundamentals that underlie sound and is designed to serve as an introduction to those who are interested in going further. We will discuss wave theory, sound propagation, constructive and destructive interference, beats, and resonance, among other ideas. This course will be mixed between a lecture/discussion and a hands-on lab and students will be expected to design their own final project extending the ideas of the course.

Course Goals: After this course is completed, I hope you will have developed an understanding of:

- The physical nature of sound
- How sound moves and interacts with matter
- How sound is created, in both an analog and digital way
- How sound is considered in the design of rooms, buildings, and other structures

While this course is grounded in the **physics** of sound, my hope is that what you learn in this class will be broadly applicable to the work you do in your own areas of focus.

Problem Sets: You will be assigned problem sets regularly throughout the term. These problem sets will take different forms, but will usually contain a mix of qualitative questions, quantitative problems, and longer-form essay questions. On the quantitative problems, you are required to show your work and state any assumptions you make. This will help me to understand your reasoning and, where appropriate, award partial credit. In general, I do not accept late problem sets. Please see me in extraordinary circumstances. They will be due on the date indicated on the set (usually within about a week of being assigned).

A note on collaboration: With a few exceptions (which will be explicitly noted), collaboration on problem sets is welcome and, in fact, encouraged. One of the best ways to learn something difficult is to work through it with other students. However, you should ensure that the work you turn in is your own. Distinguishing between these two different aspects of work can be challenging. One good rule of thumb is to work together to get to the right answer, but then write up the problem set on your own, using your own words. It may take some extra time, but it's a way to minimize the chance of plagiarism and also gives you another chance to really understand the material. If you have any questions, ***please ask.***

Labs: We will use part of class time to work through laboratory experiments, designed to help you understand and construct knowledge of the physical phenomena we examine in class. You will **not** be expected to create formal write-ups, but you **will** be expected to carefully carry out the experiments and keep a neat, insightful lab notebook.

Project: As a capstone project for this class, you will be expected to conduct some sort of project that takes the work that we've done in this class and extends it beyond what we did. This could be some form of research paper, a lab project, some piece of creative work, or something else entirely. As long as the project is grounded in the physics of sound, it is an appropriate project for this class. More details to follow.

Class Participation: There is a large amount of educational research showing that lecture alone is ineffective in instilling a deep understanding. In the last couple decades, interactive lecturing has found its way into large lecture classrooms. We're really lucky here at Bennington that we don't need to figure out how to teach and learn in 200-person classes, but we can use what they have learned to help us here.

Voting Cards
I will give you a card at the beginning of the term, which allows you to represent one of four choices. Most days, there will be opportunities to vote and confer with your neighbors. These discussions and participating in class voting are an important part of your class participation grade.

Active Participation in Class
This is a small, seminar-based class. I expect everyone in class to ask questions, participate in discussions, help to work on problems, and generally contribute to a positive classroom environment. I recognize that some students are more comfortable doing this than others, but my expectations are that you will contribute to the best of your ability.

Please note that ***class attendance is mandatory***. As a once-a-week class with only six (!) meetings, it is critically important that you attend all classes. Missing even one class can seriously affect your class participation grade. Missing 2 or more classes during the semester may lead to you failing the class. Please see me in extraordinary circumstances.

Evaluation/Grading:

35% Problem Sets 15% Labs 20% Class Participation 30% Project

Tentative Schedule (likely to change)

	Topic
April 14	Fundamentals of Waves and Sound
April 21	Interference, Resonance, and Beats
April 28	Vibrating Strings
May 5	*PLAN DAY (No Class)*
May 12	Musical Instruments
May 19	Recording and Sensing Sound
May 26	Acoustics + Final Projects