

Science and Technology of Musical Sound (PHYS 1270)

Summer 2026

Lecture: MTWR 11:00 am - 12:50 pm in Sage Hall, Room 355

Instructor Information

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Course Information

Course Description: This course provides an introduction to the physical principles underlying musical sound, with emphasis on sound production, propagation, and perception. Topics include vibration and oscillation, wave motion, standing waves, resonance, normal modes, sound radiation, and the acoustical behavior of musical instruments. The course emphasizes the connection between physical models and audible phenomena, using both qualitative reasoning and quantitative analysis.

Instruction is centered on lectures, in-class demonstrations, and discussions that illustrate fundamental acoustical principles. Weekly homework assignments develop analytical skill and reinforce conceptual understanding. Laboratory experiments provide direct experience with measurement techniques, data interpretation, and the limitations of physical models. Together, lectures, demonstrations, and labs emphasize how abstract wave descriptions correspond to real sound sources and listening experiences.

By the end of the course, students will be able to analyze musical sounds using physical principles, interpret experimental data related to acoustical systems, and apply wave models to strings, air columns, membranes, and resonant structures encountered in musical contexts.

Prerequisite: Math 1100 (or equivalent), or consent of instructor. The course assumes familiarity with algebra; additional mathematical tools will be introduced as needed.

Course Structure: The course is organized in several sections:

- Vibrations, waves and sound
- Perception and measurement of sound,
- Musical Instruments,
- The human voice
- Select topics on Electroacoustics and Acoustics of Rooms

Weekly homework assignments support the lecture material and reinforce problem-solving skills. Three midterm exams and a comprehensive final exam assess conceptual understanding, physical reasoning, and problem-solving ability. A required laboratory component runs in parallel with the lecture, emphasizing experimental observation, measurement of acoustical quantities, and comparison between theory and experiment.

Laboratory: The laboratory component of the course emphasizes hands-on measurement and analysis of sound and vibration, reinforcing concepts introduced in lecture through experiment and data interpretation. Labs make 20% of your overall grade. The Lab section of this course has its own instructor, Canvas page, and syllabus. Labs and their grading is administered by Matthew Abbot (matthew.abbott@unt.edu).

How to Succeed in this Course

In my experience, you will set yourself up for success if you:

1. Come to class and pay attention. Class attendance is strongly correlated with final grade in this course.
2. Read the slides and extra material provided. There are amazing examples to help you process the approaches and math steps in problem solving.
3. Prioritize at home practice, as this is where you really learn physics. Use at home practice as a self-test: if you can't solve a problem, try to identify what you don't understand. Review your lecture notes but also get help right away when you need it (see Support section).
4. Use Distributed Practice – study for short periods each day instead of long sessions. It is very important to keep up and not fall behind.

I plan to provide all important course announcements in lecture, but there may be times I may need to communicate something to you before the next lecture. I will utilize Canvas Announcements for this, so be sure to have your notifications turned on. To learn more about campus resources and information on how you can be successful at UNT, go to unt.edu/success and explore unt.edu/wellness. To get all your enrollment and student financial-related questions answered, go to scrappysays.unt.edu.

Support

I do not expect you to go through this course alone. Whenever you find yourself in need of some assistance, know there are options available to you. Feel free to drop by during my office during office hours or schedule an appointment via email. I will also respond to emails regularly between the hours of 9 AM – 4 PM Monday through Friday and will do my best to respond in a timely fashion on the weekend and in the evening. FREE tutors provided by the Physics Instructional Center o There are free tutors in Hickory Hall in the Physics and Chemistry Resource Center (Room 266).

The University of North Texas makes reasonable accommodations for students with disabilities. To request accommodations, you must first register with the Office of Disability Access (ODA) by completing an application for services and providing documentation to verify your eligibility each semester. Once your eligibility is confirmed, you may request your letter of accommodation. ODA will then email your faculty a letter of reasonable accommodation, initiating a private discussion about your specific needs in the course.

You can request accommodations at any time, but it's important to provide ODA notice to your faculty as early as possible in the semester to avoid delays in implementation. Keep in mind that you must obtain a new letter of accommodation for each semester and meet with each faculty member before accommodations can be implemented in each class. You are strongly encouraged to meet with faculty regarding your accommodations during office hours or by appointment. Faculty have the authority to ask you to discuss your letter during their designated office hours to protect your privacy. For more information and to access resources that can support your needs, refer to the [Office of Disability Access](https://studentaffairs.unt.edu/office-disability-access) website (<https://studentaffairs.unt.edu/office-disability-access>).

Expectations

As the instructor in this course, I am responsible for

- providing course materials that will assist and enhance your achievement of the stated course goals,
- providing timely and helpful feedback within the stated guidelines, and
- assisting in maintaining a positive learning environment for everyone.

As a student in this course, you are responsible for

- reading and completing all requirements of the course in a timely manner,
- working to remain attentive and engaged in the course and interact with your fellow students, and
- assisting in maintaining a positive learning environment for everyone.

Creating an Inclusive Learning Environment

I value the many perspectives students bring to our campus. Please work with me to create a classroom culture of open communication, mutual respect, and belonging. Not everyone will know every answer right away, and there will be many times where a misconception prevents someone from getting to the right answer. Let's all work together to learn all much as we can. All discussions should be respectful and civil. Although disagreements may happen and debates are encouraged, personal attacks are unacceptable. Together, we can ensure a safe and welcoming classroom for all. If you ever feel like this is not the case, please stop by my office and let me know. We are all learning together.

Recommended Materials

- The Science of Sound, 3rd Edition (Rossing, Moore & Wheeler, 2002)

Assessing Your Knowledge

Your final grade will be calculated as follows:

Attendance	10%
Laboratory	20%
Homework	15%
Daily quizzes	10%
Exam 1	10%
Exam 2	10%
Exam 3	10%
Final exam	15%
Overall grade	100%

Letter grades are assigned as follows:

A = 90.0 to 100 B = 80.0 to 89 C = 70.0 to 79 D = 60.0 to 69 F = below 60

Grades on the border of a letter grade **will not** be bumped.

Homework, quizzes and exams will be done in paper. Late homework and quizzes may be accepted no later than 2 days after due date and will be given partial credit unless the tardiness is justified.

This syllabus is subject to revision through the semester.

Course Schedule

<i>Date</i>	<i>Description</i>
<i>May-18</i>	<i>Syllabus What is sound?</i>
<i>May-19</i>	<i>Vibrating systems Waves I</i>
<i>May-20</i>	<i>Waves II Resonance</i>
<i>May-21</i>	<i>Hearing Sound Pressure, Power and Loudness I</i>
<i>May-25</i>	<i>Memorial Day - No class</i>
<i>May-26</i>	<i>Sound Pressure, Power and Loudness II Pitch and Timbre</i>
<i>May-27</i>	<i>Combination Tones and Harmony Musical Scales and Temperament I</i>
<i>May-28</i>	<i>Exam 1, 11-11:50 am Musical Scales and Temperament II</i>
<i>June-1</i>	<i>String Instruments</i>
<i>June-2</i>	<i>Brass Instruments Woodwind Instruments</i>
<i>June-3</i>	<i>Percussion Instruments</i>
<i>June-4</i>	<i>Exam 2, 11-11:50 am Keyboard Instruments</i>
<i>June-8</i>	<i>Speech Production</i>
<i>June-9</i>	<i>Speech Recognition, Analysis, and Synthesis</i>
<i>June-10</i>	<i>Singing</i>
<i>June-11</i>	<i>Exam 3, 11-11:50 am Sound Recording</i>
<i>June-15</i>	<i>Auditorium Acoustics</i>
<i>June-16</i>	<i>Environmental Noise</i>
<i>June-17</i>	<i>Demos and review</i>
<i>June-18</i>	<i>Final exam, 11 am - 12:50 pm</i>

