Course Syllabus

Physics 240: Physics of Sound and Music

Fall Semester, 2025

Instructor:	Dr. Steven Sahyun
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Phone:	262-472-5113
E-mail:	sahyuns@uww.edu
WWW:	http://sahyun.net/courses/physcs240
CANVAS:	**http://www.uww.edu/CANVAS**
Class Meetings:	M W 12:30 p.m. – 1:45 p.m. in Upham Hall 166. See the attached schedule and at: http://sahyun.net/courses/physcs240/schedule.pdf for class meeting dates, class topics, homework and exam dates.
Course Modality:	This course is Face-to-Face instruction.
Exams:	There will be two mid-term exams and one final exam. Exams will be **on-line** with due dates given on the attached schedule for homework and mid-term exam dates. Final: Monday December 8, 12:15 p.m. – 2:15 p.m.
Office Hours:	M F 9:00 a.m. - 9:50 a.m.; 2:00 - 3:30 p.m. or by appointment.
Required Text:	**Principles of Musical Acoustics**, Hartmann, Springer press. Available through UW-Whitewater text rental.

Additional articles and materials will be provided by your instructor.

Math Pre-requisite MATH 139 OR MATH 141 OR MATH 142

Note: The last day to drop classes is Sept. 15 (no 'W'); Oct. 24 ('W' grade.)

Other required materials: You are expected to bring a calculator (a "scientific calculator"-- one with trigonometric and logarithmic functions, scientific notation, etc. is preferred.) These are available for **less than** $20 OR may be an app on your smart-phone.

Office hours are held by your instructor for your benefit. If you want to see your instructor and do not have free time during an office hour, please make an appointment. Appointments may be made after class, by phone, or by e-mail.

Course Description:

A descriptive course that deals with various properties of sound, the generation of sound by traditional musical instruments and the electronic production and reproduction of sound. The physical process of hearing and the acoustical properties of rooms are also included.

This is a GN Science Course. Courses in this area will explore the phenomena of the natural world in the context of everyday life and contemporary problems. This course will encourage curiosity and appreciation of scientific discovery and inquiry through the examination of scientific processes. Students will develop their ability to read and comprehend scientific

information and use that information to make judgements and draw appropriate conclusions about its influence on the world around them.

This is a one-semester introduction to the physics of sound and music! You can't wake up in the morning, walk down the street, or even sit in an open, quiet field without experiencing sound. It is such a common phenomenon that there is a tendency to think of it as very simple. In the way we use it every day, it can be... but, look (and listen) closer, and you will find there are innumerable facets to it, especially when extended to the sometimes mysterious realm of music. Why certain musical sounds seem so pleasant while others grate endlessly (which ones do which is, of course, a subject of taste) is a question that probably cannot be answered in words, but it certainly can be considered in interesting ways.

Course Learning Goals:

We will explore the worlds of sound and music in this course. Though this is a physics course, and we will use some algebra, but most of the material will be presented in terms of concepts, pictures and activities.

- understand, read, comprehend and discuss comfortably basic physical concepts of music and sound in general
- recognize similarities and differences, recognizing patterns, summarize information, generalize concepts, identifying problems and understanding the context, being able to research on your own and to collaborate with others, to work in team, to learn how to collaborate and adapt, how to respect the diversity of individuals.

Course Expectations

The following information outlines what is expected from you, the student learner, in an online course.

1. You are expected to participate in the course on a regular basis. There will be daily in-class activities and reading summaries that will be discussed in class. Also, there will be weekly homework.

2. You must make a commitment to actively learn. In a normal academic term, the university would tell you to schedule two hours per week for each credit per course for learning activities***. (3 credit course x 2 hours=6 hours/week for reading/learning course material + homework)***

3. Collaborating with other students enriches your learning activities. The course is designed to encourage and reward collaboration. Therefore, you are expected to participate in discussion forums and contribute to the body of knowledge for this subject throughout the course.

Assignments: The course will consist of participatory lectures. You will be frequently asked to work on questions related to the material under discussion. You will have a chance to discuss your answers with a neighbor, and then with the class as a whole. While not graded, these activities provide valuable opportunities to understand physics concepts.

Reading Summaries: There will be a reading summary due for each assigned reading chapter and are due at the start of the class as we will begin each day with a group discussion on your summary. Please submit your summaries on CANVAS.

Homework: Homework problems are assigned on a weekly basis. While you may work together on these problems, you are expected to do your own work. Homework is due before class the day for which it is due and will be assigned at least one week prior to the due date. Homework will generally be assigned as on-line CANVAS QUIZZES and will not be available after the due date so it is to your advantage to complete the quizzes as early as possible. You will have an unlimited number of tries on the quizzes up until the due time, but your score will be that of your last attempt.

Group Activities: There will be graded in-class group activities. These activities are included so that each student will learn to use basic measuring apparatus and methods. These activities may be made up if missed due to university-sponsored events, but prior approval is needed. Activity assignments received more than one class period after assigned will receive half credit.

Exams: Finally, there will be two mid-term exams as well as the final exam. The final is similar to the mid-term exams and will be on material from chapters not covered on the previous exams. In an effort to provide equal access and availability, exams will be available as a CANVAS QUIZZES and will be available over a 1-day time-frame. Exams may be completed in-class on the assigned day or they may be completed remotely.

GRADING CRITERIA:
Course grades will be determined by the percentage of total points assigned for the course.

93% = A,	80% = B-,	67% = D+,
90% = A-,	77% = C+,	63% = D,
87% = B+,	73% = C,	60% = D-,
83% = B,	70% = C-,	< 60% = F.

The **approximate** distribution and estimated number of points are:

Course component	Point value	~ %
Homework (8 @ 10 pts each)	80	28%
Midterm 1	40	14%
Midterm 2	40	14%
Final	40	14%
Chapter summaries (22 @ 2 pts each)	44	16%
In-Class activities (20 @ 2 pts each)	40	14%
Total points =	284 points	

See the attached schedule for Exam and assignment dates.
I reserve the right to adjust grades slightly based on class participation. There may be a few extra credit opportunities posted on CANVAS and other occasional opportunities for extra credit may arise. Extra credit is limited to 10 points. Extra credit must be submitted in the CANVAS dropbox and must be submitted before the last class.

CANVAS Grade book: Grades (exams, activities, papers and homework items) will be posted on CANVAS as a **courtesy** and are for your information so that you can check that all your items have been accounted for. The CANVAS grade book is not the definitive score as transcription errors can occur, but it should match my personal grade book. Please inform me if you notice any errors. The homework and extra-credit totals will only be occasionally updated; I will try to update the grades at other times if requested.

Use of Artificial Intelligence (AI) in coursework

While the use of AI (Artificial Intelligence) for text generation may be helpful as a starting point to overcome writer's block as well as for checking spelling, grammar and structure, the purpose of the coursework is **for you to reflect on your learning** of the material and to put **your own** thoughts into words. The use of AI as an AID in improving writing and analysis is permissible, **however, any assignment that *appears*, according to the grader's judgement, *overly reliant* on use of AI for submitted assignment will be given between no credit up to, at maximum, half-credit. In the event of questionable material, you may demonstrate your content contribution for item reevaluation.**

Campus Policies and Practices Statement

Course Policy Regarding Video/Audio Recording:
In order to encourage a classroom environment where the free exchange of ideas is possible, video and audio recording must be limited to that done for educational purposes. Prior instructor permission and notification of fellow students is required for any video or audio recording.

The University of Wisconsin-Whitewater is dedicated to a safe, supportive, and non-discriminatory learning environment. It is the responsibility of all students to familiarize themselves with UWW policies regarding: Special Accommodations, Academic Misconduct, Religious Beliefs Accommodation, Absence for University Sponsored Events, the "Rights and Responsibilities" section of the Undergraduate Catalog or the "Academic Requirements and Policies" section of the Graduate Catalog, the "Student Academic Disciplinary Procedures" (UWS Chapter 14), and the "Student Non-academic Disciplinary Procedures" (UWS Chapter 17). Federal law requires all university employees to report information obtained during the course of their duties regarding sexual misconduct, including domestic and dating violence, unless otherwise exempt by state law. For more information, including on how to report an incident, see http://www.uww.edu/sexual-misconduct-information. If you have questions or concerns, you are encouraged to talk with your course instructor or department chair.
COVID related Policy: See the UW-Whitewater for the latest campus policy related to COVID.

Absence for University Sponsored Events

University policy adopted by Faculty Senate and the Whitewater Student Government states that students will not be academically penalized for missing class in order to participate in university-sanctioned events. They will be provided an opportunity to make up any work that is missed; and if class attendance is a requirement, missing a class in order to participate in a university event will not be counted as an absence. A university event is defined to be any intercollegiate athletic contest or other such event as determined by the Provost. Activity sponsors are responsible for obtaining the Provost's prior approval of an event as being university sanctioned and for providing an official list of participants. Students are responsible for notifying their instructors in advance of their participation in such events.

Group Activities: There will be regular in-class group activities. These activities are included so that each student will learn to use basic measuring apparatus and methods. These activities may be made up if missed due to university-sponsored events, but prior approval is needed.

ABSENCE POLICY FOR QUIZZES AND EXAMINATIONS

1. Chapter discussions are graded on the date due, but submissions up to the related exam are possible at reduced credit. If you need extensions for the chapter discussions, please let me know. Missed discussions will be recorded as a 0 grade.
2. Since the homework is available from the beginning of the semester and will be submitted on-line, missed homework assignments can only be provided if you have an excused absence. If you are absent from class when the homework is assigned, you are expected to obtain the problem from a classmate and hand it in at the required time. A missed homework assignment will be recorded as a 0 grade.
3. Since the exams will be available for a period on-line, there will be no make-up of missed exams/quizzes unless you have an excused absence for a University activity, family emergency or significant health related problems. Written documentation is required and you have to inform the instructor in advance.

* **I reserve the right to modify the schedule as necessary.**

FINAL EXAM SCHEDULE

All instructional staff of on- and off-campus classes are expected to meet during their scheduled final exam times. All comprehensive final exams shall be administered at the prescribed time during the final exam times. For those classes where there is no final exam, the time prescribed during the final exam times shall be used as a regular class meeting. Exception to meeting classes during the exam times requires specific written approval in advance from the college dean.

The general schedule will be available via PDF around the beginning of the given term. Due to the amount of department requested changes, the specific final exam schedule in WINS will not be available to view until after the tenth day of classes for the term.

For classes that have set meeting times, the final exam shall be administered at the prescribed time during finals week. For classes with set meeting times that do not have a final exam, the time prescribed during finals week shall be used as a regular class meeting.

For classes without set meeting times (ie. online classes), the timing of the final exam or final assignment is at the discretion of the instructor within finals week.

No undergraduate student shall be required to take more than two comprehensive final exams on the same day. Any student with more than two comprehensive final exams scheduled for the same day may elect to reschedule the additional examination(s). These alternative arrangements are available only when the exams are comprehensive.

- Final exams for web-based and arranged classes are to be held during final exam week at the discretion of the instructor.
- Final exams for off-campus classes are to be held at the regular class meeting time that falls during the final exam week.
- Classes offered at times not listed below do not have designated final exam times. Instructors are to make arrangements by the end of week 11 to administer these exams during the standard final exam times*.
- Instructors needing an alternative time or location, different than the one assigned, must work with their department associate to request an alternative.
- 0.5 - 1 unit courses will not be assigned a final exam time. However, if instructors would like to host a final exam, please contact the Registrar's Office by the tenth day of classes to ensure proper time and room assignments occur.

Monday

7:45-9:45 am	MW, MWR, MWF, MTWR, MF or WF classes beginning between 7:00-8:50 am
10:00-12 Noon	MW, MWR, MWF, MTWR, MF or WF classes beginning between 10:00-10:50 am
12:15-2:15 pm	MW, MWR, MWF, MTWR, MF or WF classes beginning between 12:00-12:50 pm
2:30-4:30 pm	MW, MWR, MWF, MTWR, MF or WF classes beginning between 2:00-2:50 pm
4:45-6:45 pm	M, MW, MWR, MWF, MTWR or MF classes beginning between 4:00-6:25 pm
7:00-9:00 pm	M, MW, MWR, MWF, MTWR or MF classes beginning 6:30 pm or later

Tuesday

7:45-9:45 am	TR, MTR, MTWRF or TWR classes beginning between 7:00-8:50 am
10:00-12 Noon	TR, MTR, MTWRF or TWR classes beginning between 10:00-10:50 am
12:15-2:15 pm	TR, MTR, MTWRF or TWR classes beginning between 12:00-12:50 pm
2:30-4:30 pm	TR, MTR, MTWRF or TWR classes beginning between 2:00-2:50 pm
4:45-6:45 pm	T, TR, MTR or MTWRF classes beginning between 4:00-6:25 pm
7:00-9:00 pm	T, TR, MTR or MTWRF classes beginning 6:30 pm or later and Common Exam 1

Wednesday

7:45-9:45 am	MW, MWR, MWF, MTWR, MF or WF classes beginning between 9:00-9:50 am
10:00-12 Noon	MW, MWR, MWF, MTWR, MF or WF classes beginning between 11:00-11:50 am
12:15-2:15 pm	MW, MWR, MWF, MTWR, MF or WF classes beginning between 1:00-1:50 pm
2:30-4:30 pm	MW, MWR, MWF, MTWR, MF or WF classes beginning between 3:00-3:50 pm
4:45-6:45 pm	W or WF classes beginning between 4:00-6:25 pm
7:00-9:00 pm	W or WF classes beginning 6:30 pm or later

Thursday

7:45-9:45 am	TR, MTR, MTWRF or TWR classes beginning between 9:00-9:50 am
10:00-12 Noon	TR, MTR, MTWRF or TWR classes beginning between 11:00-11:50 am
12:15-2:15 pm	TR, MTR, MTWRF or TWR classes beginning between 1:00-1:50 pm
2:30-4:30 pm	TR, MTR, MTWRF or TWR classes beginning between 3:00-3:50 pm
4:45-6:45 pm	R or TWR classes beginning between 4:00-6:25 pm
7:00-9:00 pm	R or TWR classes beginning 6:30 pm or later and Common Exam 2

Friday*

7:45-9:45 am	F only classes beginning between 7:00-9:55 am
10:00-12 Noon	F only classes beginning between 10:00-11:55 am
12:15-2:15 pm	F only classes beginning between 12:00-1:55 pm
2:30-4:30 pm	F only classes beginning between 2:00-3:55 pm
4:45-6:45 pm	F only classes beginning between 4:00 pm or later

*Friday will also include courses offered at a non-standard start time and special makeup exams for on-campus students if authorized by the instructor.

Saturday
Saturday classes should hold exams during the meeting time that falls during exam week.

Sunday
Sunday classes should hold exams during the meeting time that falls during exam week.

Tentative Physics 240 Schedule			Fall 2025			updated 8/25/2025
Week	**Class**	**Day**	**Date**	**Read before Class:**	**Class Topic**	**Homework DUE**
1	1	Wed	3-Sep	Chapter 1	Introduction	
2	2	Mon	8-Sep	Chapter 2	The Physical Nature of Sound Vibrations	Chapter 2 comments
	3	Wed	10-Sep	Chapter 3	Vibration modes and Resonance	Chapter 3 comments
3	4	Mon	15-Sep	Chapter 5	Sound Waves	Chapter 5 comments, Homework 1
	5	Wed	17-Sep	Chapter 6	Wave Properties	Chapter 6 comments
4	6	Mon	22-Sep	Chapter 7	Standing Waves - Strings	Chapter 7 comments, Homework 2
	7	Wed	24-Sep	Chapter 8	Standing Waves - Pipes	Chapter 8 comments
5	8	Mon	29-Sep	Chapter 9	Building Waves: Fourier Synthesis and Analys	Chapter 9 comments, Homework 3
	9	Wed	1-Oct	Chapter 10	Sound Intensity	Chapter 10 comments
6	10	Mon	6-Oct	Chapter 11	The Ear and Hearing	Chapter 11 comments
	11	Wed	8-Oct		**Midterm 1 Exam** **Chapters 1, 2, 3, 5, 6, 7, 8, 9**	
7	12	Mon	13-Oct	Chapter 12	Loudness Perception	Chapter 12 comments, Homework 4
	13	Wed	15-Oct	Chapter 13	Pitch	Chapter 13 comments
8	14	Mon	20-Oct	Chapter 14	Sound Localization	Chapter 14 comments, Homework 5
	15	Wed	22-Oct	Chapter 15	Acoustics	Chapter 15 comments
9	16	Mon	27-Oct	Chapter 16	Electromagnetic induction and speakers	Chapter 16 comments, Homework 6
	17	Wed	29-Oct	Chapter 17	Distortion and Noise	Chapter 17 comments

10	18	Mon	3-Nov	Chapter 18	Audio Systems	Chapter 18 comments
	19	Wed	5-Nov		**Midterm 2 Exam:** **Chapters 10, 11, 12,13, 14, 15, 16, 17**	
11	20	Mon	10-Nov	Chapter 19	Loudspeaker design	Chapter 19 comments
	21	Wed	12-Nov	Chapter 20	Digital Audio	Chapter 20 comments
12	22	Mon	17-Nov	Chapter 22	Voice and Speech	Chapter 22 comments, Homework 7
	23	Wed	19-Nov	Chapters 23, 24	Insruments - Brass and Woodwind	Chapters 23, 24 comments
13	24	Mon	24-Nov		Review / Make-up	
		Wed	26-Nov		**Fall Break**	
14	25	Mon	1-Dec	Chapters 25, 26	Instruments - String and Percussion	Chapters 25, 26 comments, Homework 8
	26	Wed	3-Dec	Chapter 27	Electronic Music, Synthesizers, MIDI, etc.	Chapter 27 comments
15	27	Mon	8-Dec		**Final Exam 12:15 p.m.- 2:15 p.m.** **Chapters 18, 19, 20, 22, 23-24, 25-26, 27**	