POINT 19 02 LOMA
NAZARENE UNIVERSITY

Department of Physics and Engineering

PHY1034/1034L The Physics of Sound and Music and Lab (3 +1 Units)

MWF 1:30-2:25 RS 265; R 7:30-9:10 RS 265

Fall 2021: August 31-December 10

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Office hours: Appointment as needed.

PLNU Mission: To Teach ~ To Shape ~ To Send Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Department Mission: The Physics and Engineering Department at PLNU provides strong programs of study in the fields of Physics and Engineering. Our students are well prepared for graduate studies and careers in scientific and engineering fields. We emphasize a collaborative learning environment which allows students to thrive academically, build personal confidence, and develop interpersonal skills. We provide a Christian environment for students to learn values and judgment, and pursue integration of modern scientific knowledge and Christian faith.

Foundational Explorations Mission: PLNU provides a foundational course of study in the liberal arts informed by the life, death, and resurrection of Jesus Christ. In keeping with the Wesleyan tradition, the curriculum equips students with a broad range of knowledge and skills within and across disciplines to enrich major study, lifelong learning, and vocational service as Christ-like participants in the world's diverse societies and culture.

Course Description: An introduction to the science of sound, hearing and music. The course will focus on concepts of sound production, propagation, and perception including topics such as musical scales, instruments, and acoustics. PHY1034L is the co-requisite lab course designed for a hands-on exploration of the physics of sound.

Foundational Experience & Course Learning Outcomes: This course is one of the components of the Foundational Experience program at Point Loma Nazarene University, through which students will acquire knowledge of human cultures and the physical and natural world while developing skills and habits that foster life-long learning. Specifically, this course supports this broader context in developing FELO 1e. Quantitative Reasoning: Students will be able to solve problems that are quantitative in nature.

Within these broader goals, this course develops students' skills so they will be able to:

1. translate the description of physics problems into the mathematical equations required to solve them using relevant physical principles.
2. calculate solutions to physics problems once appropriate equations or techniques are identified.
3. predict reasonable answers in appropriate problems, and assess the reasonableness of calculated answers
4. comprehend relevant physical concepts and apply them to the analysis of sound and instruments
5. create and interpret graphical and visual representations of physical quantities (such as interpreting waveforms and how they relate to perceived sounds)
6. recognize the instrument groups and to understand how they function
7. understand how the ideas and techniques of physics are used to analyze sound, operation of instruments and the propagation of musical sound
8. apply inquiry and laboratory techniques in the pursuit of knowledge of the technical aspects of music and its production.

Required Texts and Materials

- Physics and Music: The Science of Musical Sound (Dover Books on Physics): White, Harvey E., White, Donald H. Either Paperback or ebook
- a calculator

Course Credit Hour Information: In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 4 unit class (3 unit lecture + 1 unit lab) delivered over 15 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

Assessment and Grading: The grade you earn in this course is based on the scale below. The points you receive during the course are weighted accordingly:

(5%) Preclass - Submitted before class lecture days through canvas.

(25%) Lab - Due on most Thursdays. Labs cannot be made-up unless prior consent or a well-documented emergency.

(20%) Homework - Due most Fridays at the beginning of class.

(30%) 3 In-semester exams - On 9/27, 10/20 and 11/22

(20%) Final exam: Wednesday 12/15 at 1:30-4:00 pm

A	B	C	D	F
A 92-100	B+ 87-89	C+ 77-79	D+ 67-69	F Less than 59
A- 90-91	B 83-86	C 73-76	D 63-66	
	B- 80-82	C- 70-72	D- 60-62	

Exams: Examinations and the Final Examination will include problems and questions over material assigned in the text, readings and handouts, as well as material presented in class. No examination shall be missed without prior consent or a well-documented emergency beyond your control. A score of zero will be assigned for an examination that is missed without prior consent or a well-documented emergency beyond your control.

Final Exam: The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in the course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

Incompletes and Late Assignments: All written assignments are to be submitted/turned in by the beginning of the class session when they are due. One homework set can be submitted up to a week late, with an email conformation sent indicating you are using your one late assignment. *All other Late work will not be accepted* without prior consent or a well-documented emergency. Preclass assignments are due at the time indicated on Canvas. Labs will normally be submitted at the end of the lab period. Incompletes will only be assigned in extremely unusual circumstances.

PLNU Copyright Policy: Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU Academic Honesty Policy: Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See Academic Policies.Links to an external site. for definitions of kinds of academic dishonesty and for further policy information.

PLNU Academic Accommodations Policy: PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities. Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center (EAC@pointloma.edu or 619-849-2486). Once a student's eligibility for an accommodation has been determined, the EAC will issue an academic accommodation plan ("AP") to all faculty who teach courses in which the student is enrolled each semester.

PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their AP in that particular course and/or if they do not wish to utilize some or all of the elements of their AP in that course.

Students who need accommodations for a disability should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. It is the student's responsibility to make the first contact with the EAC.

PLNU Attendance and Participation Policy: Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day. Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See Academic Policies site.Links to an external site. in the Undergraduate Academic Catalog. If absences exceed these limits but are due to university excused health issues, an exception will be granted.

Class Enrollment: It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

Spiritual Care: Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith. If students have questions, a desire to meet with the chaplain or have prayer requests you can contact the Office of Spiritual Development Links to an external site.Links to an external site.

Topics and Assignments at a glance:

Date	Topic	Reading	Hmk Due
8/31	Introduction ; Subjective & Objective		
9/01	Conversions of Units; Toolkit	1.1-1.6	

Date	Topic	Reading	Hmk Due
9/03	Periodic Motion, frequency	2.1-2.3; (6.1)	Hmk 1
9/08	Understanding Graphs of motion	2.4-2.6	
9/10	Transverse Waves I	3.1-3.4	Hmk 2
9/13	Transverse Waves II	3.5; 11.1-11.4	
9/15	Longitudinal Waves	4.1-4.3	
9/17	Sound Waves I - Tubes of Air	12.1-12.3	Hmk 3
9/20	Sound Waves II - Reflection, Refraction, Diffraction	5.1 - 5.6; 7.1	
9/22	Sound Waves III - Beats, Interference, Doppler	6.5 - 6.6	
9/24	Sound Waves IV - Wrap up		Hmk 4
9/27	Exam I		

Date	Topic	Reading	Hmk Due
9/29	Wave Synthesis & Analysis I	Notes	
10/01	Wave Synthesis & Analysis II	Notes	Hmk 5
10/04	Wave Synthesis & Analysis III	Notes	
10/06	Hearing I - Mechanisms for hearing	9.1-9.5	
10/08	Hearing II - dB and log scales	9.5; 10.1-10.3	Hmk 6
10/11	Hearing III - Just Noticeable Difference; Missing Resonance	10.4-10.5; 15.3; 15.5	
10/13	Musical Scales I	14.1-14.4	
10/15	Musical Scales II	14.5-14.8	Hmk 7
10/18	Musical Scales III	14.9-14.12	
10/20	Exam II		

Date	Topic	Reading	Hmk Due
10/25	Edge Tone and Bernoulli; Helmholtz	12.6, 6.2-6.4	
10/27	Woodwind 1	18.1	
10/29	Woodwind 2	18.2-18.5	Hmk 8
11/01	Vibrating Bars	13.1-13.3; 20.3-20.4	
11/03	Vibrating Membranes	13.4, 13.6; 20.8-20.11	
11/05	Brass	19.1-19.4	Hmk 9
11/08	Voice	19.11-19.12	
11/10	Acoustics I	26.6-26.7; 27.1-27.5	

Date	Topic	Reading	Hmk Due
11/12	Acoustics II	26.5	Hmk 10
11/15	Electronic Music I	Notes	
11/17	Electronic Music II	Notes	
11/19	Wrap up and Review		Hmk 11
11/22	Exam III		

Date	Topic	Reading	Hmk Due
11/29	Electricity	Notes	
12/01	Magnets and Electricity	Notes	
12/03	Microphones and Speakers	Notes	Hmk 12
12/06	Digital and Analog I	Notes	
12/08	Digital and Analog II	Notes	
12/10	Wrap up and Review		Hmk 13