Term Information

Effective Term	Autumn 2015
Previous Value	*Spring 2015*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

To change the course to a General Education Elective.

What is the rationale for the proposed change(s)?

To make the course accessible to students outside of the Speech and Hearing major.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

None

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Speech and Hearing Science
Fiscal Unit/Academic Org	Speech & Hearing - D0799
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	3340
Course Title	Introduction to the Art and Science of Sound
Transcript Abbreviation	Art/Sci of Sound
Course Description	The goal of this course is to foster an understanding of the principles, theories, and methodology of acoustics. The student will become familiar with the concepts underlying the generation and transmission of sound waves traveling through air, and an understanding of the technology used to measure, record, and reproduce sound. It is designed for undergraduate students in the Arts and Sciences.
Previous Value	*Designed to teach the basic principles of acoustics to undergraduate students in the Arts and Sciences who have had little previous experience with math or biological and physical sciences. The student should gain an appreciation of the concepts underlying the generation, transmission and measurement of sound waves traveling through air.*
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 7 Week, 4 Week (May Session), 12 Week (May + Summer)
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Laboratory, Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus

Prerequisites and Exclusions

Prerequisites/Corequisites	
Exclusions	Not open to students with credit for 340.

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	51.0202
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore, Junior, Senior

Requirement/Elective Designation

General Education course:
Physical Science

Previous Value

Required for this unit's degrees, majors, and/or minors

Course Details

Course goals or learning objectives/outcomes

- 1Apply the metric system of measurement as used in electrical and acoustical instruments.
- Use the decibel (dB) scale to express relative measures of intensity and power.
- Use an acoustic Manikin to determine the intensity level of music recorded on a personal listening device.
- Predict the reverberation time for a listening room from its dimensions and physical characteristics.
- Apply the inverse square law to sound propagation.

Previous Value

- *Be able to describe the anatomy of the human auditory system from pinna to cortex*
- *Be able to define the metrics used in the measurement of sound*
- *Be able to define the metrics used in the measurement of human auditory perception*
- *Be able to define the concept of impedance as it applies to the human auditory system*
- *Be able to apply the appropriate formulae used to quantify the measurement of sound (e.g., conversion of pressure to dB)*

Content Topic List

- Physical measurement systems including fundamental and derived units of measurement
- Simple harmonic motion and the methods used to describe it
- Fourier analysis of complex periodic motion into sine wave components and the synthesis of complex waves from sine waves
- Electrical current flow and electromotive force
- Impedance in mechanical, acoustical, and electrical systems
- Inverse-square law and propagation of sound energy in free air
- Resonance in simple spring-mass systems and complex systems such as air filled tubes
- Simple electrical circuit problems using Ohm's Law and Kirchoff's voltage and current laws
- Use of the decibel (dB) scale to express relative measures of intensity and power
- Application of inverse square law to sound propagation and the Doppler principle to moving sound sources
- Calculatation of resonant frequencies (formants) of simple air-filled tubes
- The metric system of measurement used in electrical and acoustical instruments

Attachments

- SHS_3340_syllabus_SP_Semester_15.doc: Syllabus

  (Syllabus. Owner: Ellawadi,Allison Bean)
- GE learning outcome measures_SHS_3340.docx: GE Learning Outcomes Assessment

  (Other Supporting Documentation. Owner: Ellawadi,Allison Bean)

Comments

- Any course request for SP15 needed to have reached the Registrar's Office by Dec 1 at the very latest. This is not an ASC deadline but a Registrar's deadline.To ensure proper review by the College committees, please submit a course 8-10 weeks before deadline. Please select AU15 effective term for this course request. *(by Vankeerbergen,Bernadette Chantal on 12/15/2014 07:27 AM)*
- 12/01/14: Please indicate which GE category is being requested by checking a box in the relevant section above. Consult https://asccas.osu.edu/files/ASC_CurrAssess_Operations_Manual.pdf, pp 28 & ff, for submission guidelines for the proposed GE category. *(by Haddad,Deborah Moore on 12/01/2014 04:48 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Ellawadi,Allison Bean	12/01/2014 02:55 PM	Submitted for Approval
Approved	Fox,Robert Allen	12/01/2014 03:41 PM	Unit Approval
Revision Requested	Haddad,Deborah Moore	12/01/2014 04:48 PM	College Approval
Submitted	Ellawadi,Allison Bean	12/09/2014 07:41 AM	Submitted for Approval
Approved	Fox,Robert Allen	12/09/2014 02:51 PM	Unit Approval
Approved	Haddad,Deborah Moore	12/11/2014 11:25 AM	College Approval
Revision Requested	Vankeerbergen,Bernadette Chantal	12/15/2014 07:27 AM	ASCCAO Approval
Submitted	Ellawadi,Allison Bean	01/14/2015 02:22 PM	Submitted for Approval
Approved	Fox,Robert Allen	01/14/2015 02:30 PM	Unit Approval
Approved	Haddad,Deborah Moore	01/14/2015 03:50 PM	College Approval
Pending Approval	Nolen,Dawn Vankeerbergen,Bernadette Chantal Hanlin,Deborah Kay Jenkins,Mary Ellen Bigler Hogle,Danielle Nicole	01/14/2015 03:50 PM	ASCCAO Approval

Speech & Hearing Science 3340:
Introduction to the Art and Science of Sound
Lecture: M & W 11:30 am – 12:25 pm
020 Page Hall
Recitation: One weekly 2-hour session (40 Pressey Hall - West Campus)

Instructor: L Feth (feth.1@osu.edu) (103 Pressey Hall)
TAs: Amy Stewart (stewart.857@osu.edu) & Sarah Yoho Leopold (yoho.17@osu.edu)

Course Description: The goal of this course is to foster an understanding of the principles, theories, and methodology of acoustics. The student will become familiar with the concepts underlying the generation and transmission of sound waves traveling through air, and an understanding of the technology used to measure, record, and reproduce sound. It is designed for undergraduate students in the Arts and Sciences who have limited previous experience with math or biological and physical sciences.

Required Text: ***The Science of Sound*** 3rd edition, by Rossing, Moore and Wheeler (RMW).
Other supplemental readings and resources will be announced in class and on Carmen.

Course Objectives:
A. Knowledge: Students will develop an understanding of
1. Physical measurement systems including fundamental and derived units of measurement.
2. Simple harmonic motion and the methods used to describe it.
3. Fourier analysis of complex periodic motion into sine wave components and the synthesis of complex waves from sine waves.
4. Electrical current flow and electromotive force.
5. The concept of impedance in mechanical, acoustical and electrical systems.
6. Concepts related to the inverse-square law and propagation of sound energy in free air.
7. Resonance in simple spring-mass systems and complex systems such as air filled tubes.
8. The impact of noise on humans.
9. The interaction between a room and the sounds produced inside that room.

B. Skills: Students will learn to
1. Apply the metric system of measurement as used in electrical and acoustical instruments.
2. Use the decibel (dB) scale to express relative measures of intensity and power.
3. Use an acoustic Manikin to determine the intensity level of music recorded on a personal listening device.
4. Predict the reverberation time for a listening room from its dimensions and physical characteristics.
5. Apply the inverse square law to sound propagation.
6. Calculate the Doppler shift of frequency for moving sound sources.
7. Calculate the resonant frequencies (formants) of simple air-filled tubes, and stretched strings.
8. Solve electrical circuit problems using Ohm's Law and Kirchhoff's voltage and current laws.

Grading: Homework and in-class lab assignments will be assigned every week of the quarter. Homework and labs not turned in by the due date will not receive credit. You are expected to read the textbook material **before** class, so that you are ready to learn more effectively in class. You are expected to exhibit responsible behavior, informing the instructor **in advance** of any absences. Unexcused absences will receive a zero on assignments missed. A missed lab counts as zero and no make-up labs will be permitted.

- Homework, labs, and quizzes: count **10%** each (**30%** of the overall grade)
- Quizzes on Carmen over assigned readings will be given weekly. Quizzes are due *before* class on Monday, and are on the material that will be covered in lecture that week. Quizzes are graded on the first attempt.
- Homework via Carmen is based on examples and exercises from the text. Please bring questions about homework to your lab period. Homework is graded on completion only, though Carmen will show the "grade" calculated based on percent correct.

Regardless of what is stated here; quizzes and homework are due by the date and time that appear on Carmen. It is your responsibility to ensure that you complete these items on time.

- Labs are due by the end of your assigned lab period. Labs are graded on completion and participation.
- Extra-credit is available for participation in research, and must be completed and submitted by the final day of regularly scheduled class. Further information will be provided in lecture.
- Two midterm examinations: 20% each; **40%** of the overall grade
- Final examination (cumulative): **30%** of the overall grade

Labs: Please attend only your assigned Lab section; our classes are quite full and we have limited room. Lab assignments (posted on Carmen) should be printed ahead of time and brought to lab. You are encouraged to work on your assignment prior to lab. Any hands-on portion of the lab will need to be completed during your assigned section. Assignments will be graded on completion/participation.

Mathematical Knowledge: The various mathematical techniques used to solve problems in this course will be reviewed during the first week of class. Related reading materials can be found in **Appendix A** of the textbook. Additional resources are available on Carmen. Students will need a simple and cheap (less than $20) "scientific" calculator. The calculator should be capable of logarithms (*log*) and basic trigonometric functions (*sin, cos, tan*).

Electronics Policy: Use of wireless electronic devices (i.e., cell phones, PDAs, etc.) is not permitted in lecture or recitation. If you carry a cell phone for emergency purposes, please extend the courtesy to your classmates and instructor by setting your phone to silent or vibrate. If you wish to use a notebook or tablet computer to take notes you must disable the wireless transmitter during class.

Using notebooks, tablets, cell phones, or any wireless devices during exams is forbidden.

Carmen: Use of Carmen is required for this course. Assistance with Carmen can be found at https://carmen.osu.edu/. Due dates for all homework, quizzes, and labs will be posted on-line.

Check Carmen regularly to complete homework and quizzes, view due dates, news, and updates to lectures!

Carmen will stop accepting quiz answers at the exact time listed on the assignment, according to the **server's clock**. Waiting to the last hour to complete the assignment is a really bad practice. Submissions can be delayed by routine Carmen maintenance and the load on the servers can get very high at times. Do not wait until the last minute!
Additional class information will be communicated to students via Carmen and the university email system. The email addresses assigned by the university (lastname.x@osu.edu) and provided by the registrar on the official class roster will be used. Students are responsible for checking their university email or forwarding their university email to their ISP.
For the student's convenience PowerPoint presentations will be posted at least a week in advanced of lecture; **however**, they are subject to change and updates will be posted on Carmen. Material presented in lecture and labs is intended to supplement the required reading in the text.

Academic Misconduct: It is assumed that students have read and will adhere to The Ohio State University Code of Student Conduct (http://studentaffairs.osu.edu/resource_csc.asp). Academic misconduct will **not** be tolerated. University sanctions will be initiated if academic misconduct is suspected. For detailed information on the University policy and procedures on academic misconduct:
http://oaa.osu.edu/coam/faq.html#whatisacademicmisconduct .

Students with disabilities are responsible for making their needs known to the instructors and seeking assistance in a timely manner. This syllabus and all course materials are available in an alternative format upon request.

Schedule of Assignments

Dates	Topics Covered	Reading Assignments	Lab
1/12 – 1/16	Math Review – Algebra, Trig, Logarithms & Graphs	Appendix A (textbook) & CARMEN Introduction to Acoustics (on CARMEN)	Lab #1
1/19 – 1/23	What is Sound? Why Study sound?	Chapter 1 (Quiz - Introduction)	Lab #2
1/26 – 1/30	Vibrating Systems	Chapter 2 (Quiz - Vibrating Systems)	Lab #3
2/2 – 2/6	Waves	Chapter 3 (Quiz - Waves)	Lab #4
2/9 – 2/13	Resonance	Chapter 4 (Quiz - Resonance pt. 1)	Lab #5
2/16 –	Resonance	(Quiz - Resonance pt. 2)	
2/20	**Midterm Exam #1**	**Review Wednesday / EXAM in Lab**	
2/23 – 2/27	Electrical circuits DC	Basic Electronics (on CARMEN) (Quiz - Electronics)	Lab #6
3/2 – 3/6	Electrical circuits ac	Chapter 18.1 – 18.6 (Quiz - Circuits)	Lab #7
3/9 – 3/13	Transducers	Chapters 19 & 20 (Quiz - Transducers)	Lab #8
3/16 – 3/20	**Spring Break**		
3/23 – 3/ 27	Sound Pressure, Power, & Intensity	Chapter 5.7 & 6.1 – 6.6 (Quiz – dB logs)	Lab #9
3/30 – 4/3	SPL and IL	the Decibel (on CARMEN) (Quiz – SIL/SPL)	Lab #10
4/6 –	Spectrum Level		
4/10	**Midterm Exam #2**	**Review Wednesday / EXAM in Lab**	
4/13 – 4/17	Noise	Chapters 30 & 31 (Quiz - Noise)	Lab # 11
4/20 – 4/24	Room Acoustics	Chapter 23 (Quiz – Room Acoustics)	Lab #12
4/27 –	Review for Final Exam		
5/1	**Comprehensive Final Exam**	**12 – 1:45 pm**	

SHS 3340: Introduction to the Art and Science of Sound

Natural Science / Physical Science

3. A GE rationale that answers specifically the following questions:

How do the course objectives address the GE category expected learning outcomes?

a) The objectives for this course begin with the description and measurement of mechanical motion which are fundamental to understanding how sound is generated and how it travels through the air and other sound conducting media. Basic facts, principles and theories are used to explain how the "laws of physics" are applied to describe sound.
b) Simple electrical principles are introduced so that the topic of electroacoustic transducers can be presented. To measure, store and modify sounds it is usually necessary to convert sound energy into electrical energy form, and transducers (microphones, headphones and loudspeakers) perform that function. The commonality between mechanical, acoustical, and electrical systems is used to illustrate the evolution of principles developed in mechanics into analogous principles for acoustical and electrical systems. For example, the commonality of Ohm's Law across all three systems, or the restatement of the Laws of Conservation of Matter and Energy as Kirchhoff's Laws for electrical circuits.
c) The decibel scale for relative measurement of sound intensity is introduced, and applied to practical measurement problems.
d) The effects of noise on humans, and the interaction of rooms with sounds generated in them are presented to demonstrate applications of the basic principles. These are just two problems of the contemporary world that have acoustical implications.

How do the readings assigned address the GE category expected learning outcomes?

The majority of the assigned readings are found in a widely-used textbook written by a physicist who is also an avid amateur musician. This dual background led him to develop his course for students in the liberal arts and sciences who were not majoring in engineering or physics. The text makes the physical science accessible without "dumbing it down." Textbook readings are supplemented by materials that provide more depth than the text provides, such as the materials related to electrical circuits and calculations using the decibel scale. Both basic scientific principles and practical applications are address throughout the course.

How do the topics address the GE category expected learning outcomes?

Topics covered in this course begin with the physical bases of motion, the description and measurement of simple one mass – one spring systems. Then they move to describe sustained vibration, first for mechanical systems and then in acoustical terms. Electrical circuits are added so that the study of electroacoustic transducers can be covered. The decibel scale for the relative measurement of sound intensity is defined and applied to hypothetical and realistic situations. Practical applications to the

effects of noise on people and the acoustical characteristics of rooms such as performance spaces and classrooms wrap up this introduction to sound.

How do the written assignments address the GE category expected learning outcomes?

There are short-answer quizzes and homework assignments every week, but the majority of the writing comes in the form of lab reports for the "hands-on" laboratory experiences that are coordinated with each topic.

4. A GE assessment plan which explains how the faculty will assess the effectiveness of the course in achieving the GE expected learning outcomes over time, rather than how individual student grades will be assessed.

a) The Carmen Survey Tool will be used to deliver a pre-test on the first day of the class. Multiple-choice questions will cover basic principles and applications of the concepts to be address in the class. The Survey Tool allows the students to respond anonymously so that the assessment should reflect the understanding of the group rather than any one individual.

b) Questions related to the topics covered by the pre-test will be imbedded in the final exam for the course. Responses to those questions will be analyzed separately to determine the group's understanding of basic principles and specific applications. Learning goals will be consider to have been met if at least 75% of the students who complete the course respond correctly to the embedded exam questions.

c) The data from the survey tool and final exams will be maintained on a Carmen site designated for assessment of courses offered by the department. They will be reviewed annually for the syllabus and curriculum review meeting held near the end of spring semester, and used to modify the syllabus as needed so that student who complete "Introduction to the Art and Science of Sound" will gain an appreciation of the facts, principles, theories and methods of acoustics.