

PHYS 017

Science of Sound and Sight

1 Professor contact information

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2 Course Description

(Note: This course satisfies the non-science majors science requirement at Georgetown University.)

The nature of sound and light will be addressed in this course in the context of the science behind these phenomena and in the context of our auditory and visual senses. Physics of sound, anatomy and physiology of the ear, and the pathway to the cerebral cortex, and the psychology of perception are drawn upon to understand the functioning of musical instruments as well as our perception of music. The richness of color sensation in nature and art is addressed by similarly drawing on the physics of light, as well as the anatomy, physiology, and psychology of vision.

3 Goals of the Course

- Develop an increasing appreciation of science in its ability to describe the way we relate to the world around us through auditory and visual senses.
- Develop an appreciation for the interrelationships and interdependences of the sciences. This will be accomplished by taking two topics, the nature and perception of light and the nature and perception of sound and applying the disciplines of physics, physiology and psychology in a developmental and investigative approach to their understanding.
- Develop an understanding of technology by (1) seeing ancillary applications of the topics studied (for example the ubiquitous role of resonance in the world around us) and (2) specific examples of the use of technology in augmenting and/or enhancing the senses of hearing and sight.

4 Text and Course Supplies

- *Musical Acoustics*, 3rd ed. by Donald E. Hall.
- *Light Science, Physics and the Visual Arts*, by Thomas D. Rossing and Christopher J. Chiaverina. (ISBN - 978-0-387-98827-6)

(Note: Both textbooks are available used, such as from Amazon.com. Our bookstore may also have used copies.)

5 Course Web Page

I will provide information later regarding the course web page.

6 Course Components (with percentage of course grade in italics)

6.1 Homework Assignments (*15%*)

There will be frequent homework assignments from the textbooks. These will be handed in to be graded and returned to you.

6.2 Papers (*15%*)

Throughout the semester, you will be asked to write short papers about different topics. These will vary in style and will encompass reaction papers and analytical papers.

6.3 Group Project/Presentation(s) (*10%*)

For each half of the class, there will be a group project/presentation. In the first half, the project will be simpler and cover a certain type of instrument. In the second half, they will be more extensive and cover a topic that goes a bit beyond what we cover in the class. As such, the second presentation will be weighted more heavily than the first presentation. Information for these presentations will be provided as they are assigned.

6.4 Exams (*60%*)

There will be 3 or 4 exams on dates to be determined. The exams will all be equally weighted. The final exam will **NOT** be cumulative.

6.4.1 Content

There will be two exams in each half of the course (for a total of 4 exams). There will be two on sound and music and two on light and vision. In some sense, the second exam for

each topic will rely on material covered in the first exam from that section, but there will be no questions explicitly on the material from the first half of each section.

6.4.2 Materials to Bring to the Exams

You will need writing implements (pens or pencils), an eraser, a straight edge, and a calculator for each exam. Check your calculator batteries before you come to exams.

6.4.3 Location

The exams will occur in room 502 of Reiss Hall, (where we have the lectures) on the dates to be determined by where we are in the syllabus.

7 Attendance and Other Course Policies

7.1 Attendance

Attendance to lecture is expected, but is not mandatory.

7.2 Homework

Homework must be submitted on time. No homework scores will be dropped. Late homework will be penalized 10% per calendar day late.

7.3 Makeup Exams

Makeup exams are a great inconvenience for everyone, and they will be considered only under exceptional circumstances such as serious illnesses, off-campus, university-sanctioned activities, or certain legal obligations, such as jury duty. Except in emergency situations, arrangements for makeup exams need to be made prior to the regularly scheduled exam. If an unexpected emergency prevents you from taking the exam, notify your instructor as soon as possible.

8 Cell phones and laptops

We don't want to hear cell phones or other electronic devices. Turn them off before class or at least set them on silent mode. It is very unfair to other students to have your personal affairs interfering with their education.

Laptops are distracting to you and to students around you. You are best served by leaving them at home or in your backpack, but we understand some of you may occasionally need to use your laptop during lecture. Out of consideration for your fellow students, please only use laptops in the back third of the classroom, preferably only in the last few rows.

9 Course Grades

Your final grade in PHYS 017 is determined from a weighted average of your group project (GP, 10%), homework (H, 15%), papers (P, 15%), and three exams (E, 60% total, each being 20%). You can calculate your course percentage from the following equation, where each letter corresponds to your percentage in that component of the course:

$$\text{Course Percentage} = 10*GP + 15*H + 15*P + 60*E$$

Grading Scale:

A Range	90 and above
B Range	80-89.9
C Range	70-79.9
D Range	60-69.9
F	below 59.9

The instructor reserves the right to lower the borderline percentages, but will never raise them.

10 Academic Integrity

Physics as practiced in real life is often a collaborative exercise. Students are therefore permitted and encouraged to work with classmates on homework to stimulate their own thought processes and to receive feedback from their peers on possible misconceptions. However, the written work that you submit should be yours alone – actual or effective Xerox copies of written work are not permitted.

Cheating on exams and copying homework or laboratory work are serious offenses. Any suspected cases of cheating/plagiarism will be reported and dealt with according to the rules specified by the Honor System.

Most academic integrity violations are simply incorrect choices made when students are stressed out, sleep deprived, and facing numerous deadlines. Keep this mind: it takes only a brief moment to make a bad decision, but it takes far longer to earn back the trust of instructors, advisors, and friends. Further, an academic integrity violation will follow you for years, even after you leave the university to seek your first job or professional degree. Rather than making a poor choice, take control of the situation by talking to your instructor or a counselor beforehand, especially if external pressures (roommate troubles, relationship issues, depression, etc.) are involved. Remember, Georgetown faculty take very seriously the Jesuit educational principle of *Cura Personalis* (care for the whole person).

11 Sexual Misconduct

Georgetown University and its faculty are committed to supporting survivors of sexual misconduct, including relationship violence, sexual harassment and sexual assault. University policy requires faculty members to report any disclosures about sexual misconduct to the Title IX Coordinator, whose role is to coordinate the University's response to sexual misconduct.

Georgetown has a number of fully confidential professional resources who can provide support and assistance to survivors of sexual assault and other forms of sexual misconduct. These resources include:

Jen Schweer, MA, LPC

Associate Director of Health Education Services for Sexual Assault Response and Prevention

(202) 687-0323

jls242@georgetown.edu

Erica Shirley, Trauma Specialist

Counseling and Psychiatric Services (CAPS)

(202) 687-6985

els54@georgetown.edu

More information about campus resources and reporting sexual misconduct can be found at sexualassault.georgetown.edu.

12 Preliminary Course Calendar - Summer 2017

Wk	Dates	Topic	Reading (M, W, F)		
1	6/05-6/06	Course introduction; Types of Waves		MA 1.1-5	
2	6/07-6/09	Simple Harmonic Motion; Types of Energy		MA 2.1,4	MA 2.5
3	6/12-6/14	Activities; Waves on a string; Types of sound		MA 10.1, 3.1-4	
4	6/15-6/19	Instruments; Resonance; Waves in a pipe		MA 2.5	
5	6/20-6/22	Waveforms; Sound intensity		MA 2.2, 8.1-2	MA 5.1-3
6	6/23-6/26	Ingredients in Music; Human Ear; Ear Continued		MA 7.1-3	MA 6.1
7	6/27-6/29	Pitch perception; Pitch perception		MA 17.1-3	
8	6/30-7/03	Light; Refraction			
9	7/04-7/05	Dispersion; Thin Lens; Ray diagrams	LS 1.1-8	LS 4.1-3	
10	7/06-7/07	Interference; Polarization		LS2.5, 5.1,2,6-8	LS7.1-4, 8