

SLHS 3106: Hearing Science

University of Colorado - Boulder
Department of Speech, Language, and Hearing Sciences
3 Credits

Course Mode: Online via Desire2Learn (D2L)
Instructor: Kathryn H. Arehart, PhD, CCC-A
Office: SLHS XXX
Office hours: By appointment, Zoom (<https://cuboulder.zoom.us/>) meetings available
Email: Kathryn.arehart@colorado.edu

Required Textbooks:

1. Emanuel, D. and Letowski, T. (2007). Hearing Science. Philadelphia, PA: Lippincott, Williams, and Wilkens. ISBN-10: 0781780470 | ISBN-13: 978-0781780476
2. Plack, C. (2005). The Sense of Hearing. Mahwah, NJ: Lawrence Erlbaum Associates. ISBN-10: 0805848843; ISBN-13: 978-0805848847

Course Description:

This course focuses on the three main aspects of the hearing process: sounds in the environment (physical acoustics), sounds encoded within the auditory system (physiological acoustics), and perception of sound (psychological acoustics). This course covers a great deal of material, and requires a significant commitment. Expect to spend at least 8-10 hours a week studying, preparing homework and projects, and reading.

Course Objectives:

By the end of the course, students should be able to meet the following learning goals:

- Sound: Explain the physical characterization of sounds in the environment and calculate how sound pressure and intensity are described on the decibel scale.
- Physiology: Describe the structure and function of the conductive mechanism, the cochlea, the auditory nerve and the central auditory nervous system.
- Auditory Code: Explain the specific contributions of the peripheral and central auditory nervous systems in the transmission and encoding of sounds from the environment. Relate how changes in the physical characteristics of the sound will alter its neural encoding. Identify ways in which the transmission and encoding of sounds in the auditory system may differ due to the presence of hearing loss or the presence of a cochlear implant.
- Auditory Perception: Explain the general characteristics of sound perception, including absolute sensitivity, sound discrimination, masking and frequency resolution, sound localization, and loudness and pitch. Relate how different aspects of perception are affected by changes in the physical characteristics of the stimulus. Relate the different aspects of perception to how sounds are neutrally encoded in the auditory system.
- Complex Perception: Apply basic concepts in auditory science to the study of auditory scene analysis, speech perception and music perception.
- Scientific Methods: Describe and use common experimental procedures in hearing science.
- Scientific Interpretation: Interpret data obtained from physiological and perceptual studies of hearing.
- Hearing loss: Identify ways in which the transmission, encoding and perception of sounds may differ due to the presence of hearing loss or the presence of a cochlear implant.
- Technology: Summarize and analyze current technology related to hearing.

Course Communication:

The primary communication channel for this course is the email system within Desire2Learn. Once you are there, sign in using your login name and password and click on SLHS 3106. All course materials will be accessed & submitted through this forum and you are expected to check into the course at least once every two days for updates. Please email questions, comments or concerns using this platform. My policy is to respond to emails and discussion board postings

within 36 hours on weekdays. Email messages and discussion board postings may not receive a response during weekends and holidays. Questions that would benefit all the students in the class should be posted on the discussion board. Do not post individual or private issues on the discussion board; postings that do not benefit all students in the class may be deleted. If you have a time critical issue, email me at Kathryn.arehart@colorado.edu.

Assignment Submission Policies:

Completed work **MUST** be saved as a word document or PDF and uploaded using this link as well. Do not send assignments through any other avenue (e.g., Email or pasting into “comment window”). If your assignments are not received by the course instructor as a readable word document by the assignment due date/time, no credit will be earned. No late assignments will be accepted. Take care to ensure that you are submitting a **COMPLETED** assignment. If you inadvertently send an incomplete copy, you will **NOT** be given the opportunity to revise your submission once the due date has past. Check and double-check all uploads to ensure that they are complete prior to the submission. If you submit an assignment at least 24 hours in advance with an accompanying e-mail message requesting that I check to make sure your assignment has been submitted properly I will e-mail you back confirming receipt.

Evaluation:

You may work together on all homework assignments (use the discussion board and chat rooms!). However, only turn in your own work. Allowing others to copy your work will also be considered a form of cheating. You are expected to work individually on the exams. The instructor reserves the right to fail you on an assignment that evidences cheating in any form. Please do not copy information directly from any source (internet, course lessons, textbook, journal articles etc.) and present it as your own – this is considered plagiarism. You must give proper acknowledgement to the authors, including using quotation marks and proper APA citation (author, year, page number) for their ideas, even if you slightly reword their thoughts.

Grades will be based on the following course requirements:

Tests: There are two mid-term tests, each worth 100 points of the grade (15%). Tests will consist of multiple-choice, fill-in, short-answer and short-essay questions. Makeup tests will not be given.

Final: Worth 125 points, the final will be comprehensive and may be multiple-choice, fill-in, and short answer. Approximately 75% of the exam will emphasize material from the last section of the course. Makeup finals will not be given

Soundscape Project: Worth 75 points, students will identify and analyze the physical, physiological, and perceptual aspects of an auditory scene. In this written report worth 75 points, students will provide 1) a physical characterization of the sounds within the soundscape 2) a discussion of how the sounds within the auditory environment are processed and encoded within the human auditory system 3) an analysis of the perceptions evoked by the sounds and 4) an exploration of how a person combines these perceptions in their interpretations of the auditory scene. Detailed expectations and a grading rubric will be provided during September. Students will turn in a proposal for their projects and their sound in electronic form by Saturday, October 8th. The deadline for turning in the written report is Saturday, December 3th.

Homework: Homework assignments (worth 100 points total) will be given throughout the semester. Each assignment will address one or more of the course learning goals. Some assignments involve interactive software which allows students to collect and analyze data. Specific guidelines (e.g., format; expectations) for homework assignments will be posted on Desire2Learn. Typically, homework is assigned as untimed quizzes with a due date. You have multiple opportunities to take the “quiz”.

*** Once the exam time expires, you will **NOT** be allowed to take the exam. Plan accordingly to schedule a time to take the exams. Prior to taking an exam, you must verify that your computer meets all the necessary technical requirements (see Desire2Learn Support). You will be allowed to take the exam only once. The exams will be **TIMED** and are **CLOSED BOOK**. Be aware that although exams are available for at least 36 hours, you are strongly encouraged to take the exam at your **EARLIEST** possible convenience to ensure that you are able to complete it during the exam period. Make-up

exams ARE NOT available. If you are unable to complete an exam due to an unavoidable medically-documented emergency and you wish to appeal this policy, you must contact the instructor before or within the period that the exam is available. No appeals will be considered without proper documentation. Note: computer problems and/or scheduling conflicts do not constitute an emergency. It is your responsibility to ensure that you are using and/or have access to a reliable computer. Remember, prior to taking an exam, you must verify that your computer meets all the necessary technical requirements. ***

Grading:

Grades will be calculated based on the number of points earned out of 500 possible points.

93.0-100%	A	87.0-9.9%	B+	80.0-82.9%	B-	73.0-76.9%	C	67.0-69.9%	D+	60.0-62.9%	D-
90.0-92.9%	A-	83.0-86.9%	B	77.0-79.9%	C+	70.0-72.9%	C-	63.0-66.9%	D	<60%	F

Emergency Procedures:

In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Information about changes to the course will be available via email, through D2L.

Course Schedule:

Week	Topic	Readings	Assignments/Exams
1	Course Overview; Sinusoids	Emanuel/ Letowski Ch. 1-3	
2	Complex Sounds	Emanuel/ Letowski Ch. 4	HW#1 due Sun, Sept 8 (sinusoid and complex sounds)
3	Decibel; Sound Transmission and Propagation	Emanuel/ Letowski Ch. 5-7	HW#2 due Sun, Sept 15 (decibel)
4	Nature of Sound; Sound taxonomy	Emanuel/ Letowski Ch. 4-6	HW#3 due Sun, Sept 22 (nature of sound)
5	Sound Propagation		Test #1 (Thurs 9/26 @5pm- Sat 9/28 @11:59pm)
6	Filters, resonance Introduction to Auditory System: Conductive Mechanism	Plack Ch. 4.1; Emanuel/ Letowski Ch. 8	
7	Conductive mechanism and Cochlea	Plack Ch. 4.2, Ch. 5; Emanuel/ Letowski Ch. 9	HW#4 due Sun, Oct 13 (sound propagation and conductive mechanism) Soundscape proposal due Saturday, Oct. 12
8	Cochlea and introduction to Auditory nerve	Plack Ch. 4.3, 4.4; Emanuel/ Letowski Ch. 9	HW#5 due Sun, Oct 20 (cochlea)
9	Auditory Nerve/Auditory Code	Plack Ch. 4.5; Emanuel/ Letowski Ch. 10	HW#6 due Sun, Oct 27 (auditory nerve/ auditory code)
10	CANS	outside reading to be provided	Test #2 (Thurs 10/30 @ 5pm- Sat 11/02 @ 11:59pm)
11	Methodology used to study perception; Auditory Sensitivity	Emanuel/ Letowski Ch. 12	
12	Frequency and Temporal Resolution; Masking	Plack Ch. 5 and Ch. 8	HW#7 due Sun, Nov 10 (auditory sensitivity)
13	Pitch and Loudness	Plack Ch. 6-7	HW#8 due Sun, Nov 17 (frequency resolution)
14	Sound Localization	Plack Ch. 9	
15	Complex Perception	Plack Ch. 10-11	Soundscape Project Due Wednesday Dec 11
16	FINAL WEEK		Final Exam

University Policies:

1. Students with Disabilities:

If you qualify for accommodations because of a disability, please submit to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see Temporary Medical Conditions: Injuries, Surgeries, and Illnesses guidelines under Quick Links at Disability Services website and discuss your needs with your professor.

2. Religious Observances:

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, please indicate any potential religious obligations to me at the beginning of the semester, and contact me at least three weeks prior to a specific obligation so that we may make alternate arrangements for deadlines. See full details at http://www.colorado.edu/policies/fac_relig.html

3. Honor Code:

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at <http://www.colorado.edu/policies/honor.html> and at <http://honorcode.colorado.edu>

4. Discrimination and Harassment:

The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. The University of Colorado does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, sexual orientation, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. (Regent Law, Article 10, amended 11/8/2001). CU-Boulder will not tolerate acts of discrimination or harassment based upon Protected Classes or related retaliation against or by any employee or student. For purposes of this CU-Boulder policy, "Protected Classes" refers to race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, or veteran status. Individuals who believe they have been discriminated against should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Student Conduct (OSC) at 303-492-5550. Information about the ODH, the above referenced policies, and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at

5. Learning Environment:

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at <http://www.colorado.edu/policies/classbehavior.html> and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code