

Hearing and Speech Sciences 722: Psychoacoustics



Fall 2023
Thursdays 3:30-6:00 PM
LEF1222

Instructor: Matthew Goupell
Office: 0241LEF
Office Hours: By appointment
Email: goupell@umd.edu

COURSE DESCRIPTION AND OBJECTIVES

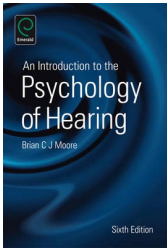
The auditory system of the brain has evolved to process the world of sounds. It allows us to detect the faint rustling of leaves that might signal the presence of a predator, to follow a friend's conversation in a loud and noisy bar, and to appreciate the subtlest of differences between melodies. Basically, the auditory system will save your life from the psychotic killers out there to get you.

This course will provide you with a solid understanding of auditory processing and psychoacoustics. Building on our knowledge gained in Instrumentation and Anatomy and Physiology, we will review basic acoustics, signals and systems, as well as fundamental knowledge of the auditory system. In the first half of the class, we will learn about the limits of auditory sensitivity and how to measure them. In the second half, we will explore supra-threshold auditory perception: the pitch of simple and complex sounds including speech, sound localization and binaural hearing, elements of speech perception, and auditory scene analysis.

At the end of this course, the students should be able to:

1. Apply principles of systems analysis to the auditory system.
2. Describe the principles of signal detection theory, and how they are applied to measuring behavioral sensitivity.
3. Describe frequency, intensity, and temporal coding by the auditory system, across those with typical hearing, those with hearing loss, and those with cochlear implants.
4. Discuss principles of binaural hearing, sound localization, and auditory scene analysis by the auditory system.

COURSE REQUIREMENTS AND POLICIES



Materials Needed:

Required Text: Brian C. J. Moore, “An Introduction to the Psychology of Hearing” – 6th Edition
Emerald Group Publishing Limited, 2012

ISBN-13: 9781780520384

Optional Text: Brian C. J. Moore, “Cochlear Hearing Loss” – 2nd Edition

Calculator: A scientific calculator (one that calculates logarithms, sines, cosines, powers, etc.) is very helpful for this course and should be brought to every class.

Class Format:

- This will be a flipped classroom.
- Reading the textbook and papers should be done before class.
- Lectures and recordings will be provided.
- Online quizzes will be provided and attempted before class. They will be due the **Sunday** after the appropriate lecture, so it is up to you to try to do your homework before the deadline.
- The in-class portion will be part discussion (questions about online exercises) and part presentations/discussion about papers from the literature. This portion is aimed to last about 2 hours (a bit shorter than the 2.5 hours shown on Testudo), but depends on people’s questions and preparation for class.

Quizzes and Exams:

- Online Exercises: There will be short online quizzes over each topic we cover for each chapter. Typically, they will be just a few points (~5-15) per topic. Online exercises can be redone as many times as you want, the last grade being kept.
- Paper Discussion Board Posts (3 pts each): Each student must post a question to the discussion board about each article by **Wednesday at 11:59 pm** (i.e., the day before class so I have time to respond).
- In-Class Exercises about Papers (~10-20 pts each): Each paper will require you to answer some online questions. These will typically require greater depth, thought, and effort than the online exercises. There are usually two papers to read per class: one typical hearing paper, one hearing-impaired / cochlear-implant paper.
- Exams (200 pts each): A midterm and a final will be given. The final is cumulative.

Grading:

Your course grade will depend upon exercises, posts, and exams.

Unexcused late assignments will have a -20% penalty applied per day.

Grades will be on an absolute scale for the follow percentages:

A+: ≥100	A: 93-99	A-: 90-92
B+: 89-87	B: 83-86	B-: 80-82

And so on...

COURSE SCHEDULE

Date	Class Number	Topics Covered	Chapter	Textbook Readings (for this class)	Papers
August 29, 2024	1	Review of Syllabus, Class Overview			
September 5, 2024	2	Signals Review + CI signals, Psychophysical Methods, Signal Detection Theory	1	Ch 1, pp. 127-131	Yost 2015, Goupell 2015
September 12, 2024	3	Thresholds and Temporal Integration	2	Ch 2	Viemeister and Wakefield 1991, Carlyon 1990
September 19, 2024	4	Frequency Selectivity, Masking, and the Critical Band	3	Ch 3	Hall 1984, Carney and Nelson 1983
September 26, 2024	5	Frequency Selectivity, Masking, and the Critical Band	3	Ch 3	Shannon 1990, Davis-Venn 2005
October 3, 2024	6	Loudness	4	Ch 4	Schoder 1994, Viemeister
October 10, 2024	7	Matt Distinguished Scholar-Teacher Lecture			
October 17, 2024	8	No Class, Take-Home Exam 1 Due			
October 24, 2024	9	Temporal Processing	5	Ch 5	Eddins 1992, Moore 1989
October 31, 2024	10	Pitch	6	Ch 6	Oxenham 2010, Goupell 2019
November 7, 2024	11	Spatial Hearing (Sound Localization)	7	Ch 7	Hoffman 1998, Otte 2013
November 14, 2024	12	Spatial Hearing (Speech in Noise)	7	Ch 7	Majdak 2011, Freyman 1999
November 21, 2024	13	Pattern and Object Perception, Central Auditory Processing Disorder	8	Ch 8	CAPD Letters, Moore 2020
November 28, 2024		<i>No Class, Thanksgiving</i>			
December 5, 2024	14	Speech Perception or Listening Effort or Other Topic of Class Choice	9	Ch 9	TBD
December 12, 2024	15	Questions and Review			
December 19, 2024	16	Take-Home Final Exam 2 Due			

Other important dates

Wed-Fri, Oct. 2-4	Rosh Hashanah
Fri-Sat, Oct. 11-12	Yom Kippur
Wed-Wed, Oct. 16-23	Sukkot
Wed-Fri, Oct. 23-25	Simchat Torah
Thur, Oct 24	Electrophysiology Midterm
Mon, Oct 28	Pediatrics Midterm
Wed-Thur, Dec 25-Jan 2	Chanukah

Attendance:

Attendance to class is not required in this class; however, it is highly encouraged because it will help you better understand the material and resolve questions.

I am very flexible to accommodate all circumstances (e.g., health issues, family matters, etc.). Just come talk to me and we can discuss adjusting deadlines as necessary.

Class Participation:

Class participation is highly encouraged.

Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to demonstrate civility with one another or me will be subject to referral to the Office of Student Conduct or to the University Campus Police. You are expected to adhere to the Code of Student Conduct.

Copy write:

Class lectures and other materials may not be reproduced for anything other than personal use without written permission from me. Lectures, materials, quizzes, and tests may not be sold to other parties.

Academic Integrity:

It is the responsibility of all students to read and understand the misconduct guidelines of UM – College Park. (<http://www.testudo.umd.edu/soc/dishonesty.html>)

Any suspicion of academic dishonesty will result in a report filed with the Student Honor Council. Any of the following acts, when committed by a student, shall constitute academic dishonesty:

- CHEATING: intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
- FABRICATION: intentional and unauthorized falsification or invention of any information or citation in an academic exercise.
- FACILITATING ACADEMIC DISHONESTY: intentionally or knowingly helping or attempting to help another to violate any provision of this Code.
- PLAGIARISM: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise.

Special Accommodations and Religious Inclusiveness:

I will make every effort to accommodate students who are registered with the Disability Support Service (DSS) Office and who provide me with a University of Maryland DSS Accommodation form. Only written DSS documentation of the accommodation will be considered. This form must be presented to me no later than **the Drop/Add date for the semester**. I am not able to accommodate students who are not registered with DSS or who provide me with documentation which has not been reviewed and approved by UM's DSS Office after **the Drop/Add date for the semester**.

It is the policy of the UM – College Park to not schedule exams on religious holidays. If I have accidentally scheduled an exam on a religious holiday that you observe, please let me know no later than **the Drop/Add date for the semester**. I will reschedule the exam for the entire class to a more appropriate date.

LEARNING OBJECTIVES AND OUTCOMES
HESP 722: PSYCHOACOUSTICS

STUDENT NAME:

SEMESTER COMPLETED: Fall 2022

Title	Exam/quiz/homework Questions	Achieved
A1. Genetics, embryology and development of the auditory and vestibular systems, anatomy and physiology, neuroanatomy and neurophysiology, and pathophysiology of hearing and balance over the life span	*	
A4. Principles, methods, and applications of acoustics, psychoacoustics, and speech perception, with a focus on how each is impacted by hearing impairment throughout the life span	*	

Method of assessment denoted by (*).

Verification of assessment denoted by checkmark.

The above-named student has successfully demonstrated mastery of these learning outcomes, through class lectures and discussion, in-class examinations, and homework assignments.

Matthew Goupell, Ph.D.
Faculty instructor

Date: