



Communication Sciences and Disorders

Course: CSD 850 Hearing Science I - Basic Acoustics and Psychoacoustics

Term: Fall 2022

Number of credits: 3

Course description

The course covers the physical aspects of sound, anatomy and physiology of the auditory system, basic concepts in psychoacoustics with respect to normal and abnormal auditory systems, basic concepts in auditory prosthesis and neuroplasticity. The course entails two 75-minute class periods each week over the Fall term and carries the expectation that students will work on course learning activities for about 3 hours outside of the classroom for every class period.

Instructor

Name: Dhatri S. Devaraju, PhD

Email: devaraju2@wisc.edu (Please include "CSD 850" in the subject line of emails)

Office hours: Wednesdays 11:50 AM – 12:50 PM, in-person or over zoom (please email your intention to attend beforehand)

Office location: Room 467, Goodnight Hall, 1975 Willow Dr, Madison, WI 53706

Schedule

Time: Mondays and Wednesdays 4.45-6 PM

Location: Goodnight Hall Room 412

Instructional modality: In-person for students in Madison campus; distance/remote synchronous for students in the Steven's Point campus

Required texts

1. Moore, B.C.J. (2012) An Introduction to the Psychology of Hearing. 6th Edition. Emerald press: Bingley. ISBN: 9004252428
2. Schnupp, J., Nelken, I., & King, A.J. (2011) Auditory Neuroscience – Making sense of sound. MIT Press: Cambridge. ISBN: 9780262113182
Available online at [UW library](#).
3. Primal 3D interactive model: Follow links provided on canvas. You will have free access.

Recommended softwares for visualization

1. [Mozaik](#) – Search for the ear and the mechanisms of hearing download
2. [Mass Eye and Ear Eaton Peabody Laboratory 3D Virtual Models](#)

Course webpage

Access through <https://canvas.wisc.edu/>

All course materials (syllabus, pre-class readings and videos, lectures, quizzes, assignments) will be available on canvas. It is your responsibility to check for updates. Lectures slides will be made available at least 1 hour before class.

Course Objectives

Upon successful completion of this course, you will be able to

- ✓ Describe the anatomy and physiology of the auditory system
- ✓ Describe physical aspects of sound as it pertains to auditory perception
- ✓ Explain the role of the peripheral and central auditory pathway in sound perception
- ✓ Explain key psychological concepts in sound processing involved in human communication
- ✓ Describe the consequences of hearing loss and the use of prosthesis on perception
- ✓ Analyze and evaluate supporting evidence in a focused topic of choice

Course content

This course consists of 5 units in the following order:

- Acoustics
- Anatomy and physiology
- Perception
- Hearing loss, prosthesis and plasticity
- Self-study (all topics)

Course calendar (subject to changes)

- ✓ Readings assigned for each class must be completed before class. Sometimes, lectures spill over and the pre-class prep for the next class may need to deviate from the calendar
- ✓ If a change is necessary, we will make an announcement in class or canvas

Unit	Date	Unit	Topic	Pre-class readings (required are non-italicized; recommended are italicized)	Deadlines
	Wed, Sep 7		Review of syllabus and introduction	No readings	
I. Acoustics	Mon, Sep 12	1.1	Sound and its Physical Characteristics	Moore Ch 1 (p.1-9) Schnupp Ch 1 (p.14-26)	Q of the day; special accommodations due.
	Wed, Sep 14	1.2 1.3	Sound transmission, Complex sounds	Schnupp Ch1 (p.3-8, p.34-43) Moore Ch 1 (p.13-22)	Q of the day
II. Anatomy & Physiology	Mon, Sep 19	2.1, 2.2	External and Middle ear	Schnupp Ch 2 (p.51-54); Moore Ch 1 (p.23-24)	Q of the day Anatomy assignment opens
	Wed, Sep 21	2.2, 2.3	Middle and inner ear	Schnupp Ch 2 (p.54-69); Moore Ch 1 (p.24-35)	Q of the day
	Mon, Sep 26	2.3, 2.4	Inner ear and Auditory nerve	Schnupp Ch 2 (p.69-86); Moore Ch 1 (p. 38-51)	Q of the day; presentation topics due
	Wed, Sep 28	2.4, 2.5	Auditory nerve; Central pathways	Schnupp Ch 2 (p.86-92); Moore Ch 1 (p.51-55)	Q of the day
	Mon, Oct 3	2.5	Central pathways	Pickles 2015 (canvas)	Q of the day; Anatomy assignment due Oct 5
	Wed, Oct 5	2.6	Exam review		Anatomy Assignment Due
	Mon, Oct 10		Exam I		
III. Perception	Wed, Oct 12	3.1	Auditory thresholds	Moore Ch 2	Q of the day
	Mon, Oct 17	3.2	Frequency selectivity	Moore Ch 3 (p.67-89)	Q of the day
	Wed, Oct 19	3.3	Masking	Moore Ch 3 (p. 89-131)	Q of the day
	Mon, Oct 24	3.4	Loudness perception	Moore Ch 4	Q of the day
	Wed, Oct 26	3.5	Spatial/binaural hearing	Schnupp Ch 5; Moore Ch 7	Binaural assignment opens; Q of the day
	Mon, Oct 31	3.6	Pitch perception	Schnupp Ch 3 Moore Ch 6	Q of the day
	Wed, Nov 2		Exam review; Sign up presentation topic (unit 5)		
	Mon, Nov 7		Exam II (non-cumulative)		
	Wed, Nov 9	3.7	Auditory scene analysis	Schnupp Ch 6; Moore Ch 8	Binaural assignment due; Q of the day
	Mon, Nov 14	3.8	Speech perception	Schnupp Ch 4; Moore Ch 9	Q of the day
IV. Hearing loss, prosthesis, plasticity	Wed, Nov 16	4.1	Effects of cochlear hearing loss	Moore pdf, Moore 1996 (canvas)	Q of the day
	Mon, Nov 21	4.2	Auditory prosthesis	Schnupp Ch 8; Moore 2003 (canvas)	Q of the day
	Wed, Nov 23		Time for presentation prep; no instruction		
	Mon, Nov 28	4.3	Plasticity	Schnupp Ch 7	Q of the day
	Wed, Nov 30		Exam III (non-cumulative)		
V. Self-study (all topics)	Mon, Dec 5	5	Presentations - Normal aspects, Hearing loss, perception with prosthesis, plasticity (2-3/day)	Readings posted by presenters	Prosem or Brains and bagels summaries due
	Wed, Dec 7				
	Mon, Dec 12				
	Wed, Dec 14				
	Exam week; will meet, if needed to wrap up				

Course grade

Final grade is based on

- ❖ Three non-cumulative exams
 - ◆ Exam I – 18%
 - ◆ Exam II – 18%
 - ◆ Exam III – 18%
- ❖ Four assignments
 - ◆ Pre-class quiz – 5% (quizzes with the lowest 3 grades can be dropped)
 - ◆ Question of the day for all classes – 5%
 - ◆ Anatomy assignment – 14%
 - ◆ Binaural listening assignment – 7%
- ❖ One presentation – 15%

Grading scale

Percentage	100-92	91.9-90	89.9-88	87.9-82	81.9-80	79.9-78	77.9-72	71.9-70	69.9-68	67.9-60	<60
UW-SP Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	F
UW-Madison Letter Grade	A	A-B		B	B-C		C	C-D		D	F

Exams

- ✓ Will be closed book and conducted in class, unless otherwise specified
- ✓ Non-cumulative
- ✓ Format: short answers, multiple choice, fill in the blanks, True/False, matching, labelling
- ✓ Questions regarding exams sent after 6 PM the day before the exam may not be answered

Pre-class quizzes

- ✓ The goal of pre-classes quizzes is to help you gain familiarity of the content that will be covered in class, to improve your engagement in class and to assess knowledge gaps, if any.
- ✓ Every class with assigned readings (except unit 5) will have a pre-class quiz, unless otherwise specified.
- ✓ The quiz will entail up to 5 to 10 questions and you will get two attempts to answer. You will be given an hour to complete the quiz and the quiz will close an hour before class. The quiz is open book (i.e. you can refer to your readings and videos, if needed, while taking the quiz)
- ✓ The content will be based on background knowledge necessary for the class topic, the assigned required readings and any videos posted. Recommended readings/videos will not be included
- ✓ Questions will be reviewed in class throughout the lecture

Question of the day (post-class)

- ✓ The goal of this task is to review and assess understanding of covered concepts before moving on to new materials. Upon successful completion of this everyday task, students will gain experience in creating questions and in applying theoretical concepts/knowledge to clinical applications.

- ✓ At the end of each class (by midnight on Mondays and Wednesdays), each student must contribute ONE content question (including the answer) and answer ONE of the implications-for-audiologists question to the course question bank via “Assignments” on canvas.
- ✓ Content question: must be one of the 3 types: multiple choice, fill in the blanks or short answers and can be based on lectures and/or readings. Tips for writing questions will be provided on canvas in each assignment description.
- ✓ Implications-for-audiologists question: Answer ONE of the following three questions
 - Why is it important for an audiologist to understand this topic?
 - How will knowing this information improve an audiologist’s clinical practice?
 - If an audiologist does not understand this topic, what are the probable mistakes that could affect patient management?
- ✓ Keep the answer short (maximum 3 sentences)
- ✓ Content questions and answers will be compiled for every class and made available for review. Questions from these banks may appear in the exam.

Anatomy assignment

- ✓ The goal of this assignment is to practice identifying the main anatomical features of the auditory system. Upon successful completion of this assignment, you will be able to identify main landmarks of the external, middle and the inner ear.
- ✓ You will be asked to take pictures of external ears and select a subset of pictures of the middle and inner ear provided, and label all requested parts.
- ✓ Assignment details including instructions and grading rubric will be provided on canvas

Binaural listening assignment

- ✓ The goal of this assignment is to experience interaural time and level differences independently. Upon successful completion of this assignment, you will be able to differentiate the nature of time and level cues and describe their level/frequency limits.
- ✓ Listening exercises that run on Praat will be available in files. Instructions with a template for assignment will be available on canvas

Self-study (research and present)

- ✓ The goal of this unit is to improve self-directed learning, assimilation of research findings and presentation skills. Upon successful completion of the presentation, you will be able to evaluate the literature and summarize a focused topic in Hearing Science
- ✓ Three class periods are dedicated for presentations. The presentations will cover one of 4 specific themes: normal hearing, hearing loss, prostheses, plasticity. You will pick a buddy to work with, pick a topic or theme for presentation at the beginning of the semester.
- ✓ Based on the topic/theme chosen, a presentation date will be assigned.
- ✓ Instructions, suggested topics and grading rubric will be provided on canvas.

Requirement for UW-Madison students

- ✓ UW-Madison students are required to attend a minimum of 3 hearing-related seminars (Prosem or Brains and Bagels) during the fall semester
- ✓ Each student will be required to write a 300-500 word summary of the seminar attended. The summary should include: research questions asked, methods used, results, and conclusions. Summaries will not contribute to the final grade, but submission is required.
- ✓ The three summaries must be compiled in a single pdf document and uploaded on canvas. The deadline is indicated on the course calendar

Academic honesty

By virtue of enrollment, each student agrees to uphold the high academic standards of the University of Wisconsin-Madison; academic misconduct is behavior that negatively impacts the integrity of the institution. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these previously listed acts are examples of misconduct which may result in disciplinary action. Examples of disciplinary action include, but is not limited to, failure on the assignment/course, written reprimand, disciplinary probation, suspension, or expulsion.

Privacy of Student Information & Digital Tools: Teaching & Learning Analytics & Proctoring Statement

The privacy and security of faculty, staff and students' personal information is a top priority for UW-Madison. The university carefully reviews and vets all campus-supported digital tools used to support teaching and learning, to help support success through learning analytics, and to enable proctoring capabilities. UW-Madison takes necessary steps to ensure that the providers of such tools prioritize proper handling of sensitive data in alignment with FERPA, industry standards and best practices.

Under the Family Educational Rights and Privacy Act (FERPA which protects the privacy of student education records), student consent is not required for the university to share with school officials those student education records necessary for carrying out those university functions in which they have legitimate educational interest. 34 CFR 99.31(a)(1)(i)(B). FERPA specifically allows universities to designate vendors such as digital tool providers as school officials, and accordingly to share with them personally identifiable information from student education records if they perform appropriate services for the university and are subject to all applicable requirements governing the use, disclosure and protection of student data.

Copyright statement – note taking, recording lectures, posting class materials and exam questions online

This syllabus and all lecture materials belong to UW Madison and the instructor, Dr. Dhatri Devaraju, Lecturer, Department of Communication Sciences and Disorders. As a student registered in this course, you are welcome to take notes and re-organize lecture materials for your personal studying benefit. You are prohibited from providing or selling course materials to anyone outside the course. Unless you have an accommodation that permits you to record my lecture (with my prior permission), you are not authorized to record my lectures [Regent Policy Document 4-1] or take photographs in class. Unauthorized use of my copyrighted materials constitutes copyright infringement and would be addressed under the university's policies, UWS chapters 14 and 17, governing student academic and non-academic misconduct.

Special accommodations

If students need any special accommodations in the curriculum, instruction or assessments of this course to enable them to fully participate, they have to meet the instructor before the first pre-class quiz. Necessary accommodations will be provided for religious observance with prior notice.

Attendance

- Attendance in all scheduled classes, including guest lectures (if any), is expected. Materials covered in class will be consolidated from multiple sources outside of the required text. Exam questions will be based on information covered in class as well as readings

- If you are unable to attend class because you are sick or for any other reason, you are expected to notify the instructor prior to class. If you are sick, you will be asked to provide a medical note via email

Course evaluations

Your confidential feedback is important to me, as the course instructor. Your course evaluation will be immensely helpful to improve the course and therefore it is an integral component of the course. I strongly encourage you to complete the course evaluation when it is requested for during the term. Your confidential feedback will be requested via [AEFIS](#). You will receive an official email two weeks prior to the end of the semester when your course evaluation is available. You will receive a link to log into the course evaluation with your NetID where you can complete the evaluation and submit it, anonymously.

Diversity & inclusion statement

Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.

ASHA standards addressed by this course/KASA statements associated with CSD 850

ASHA reference	Topic	Type of documentation/experience
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	Assignments and Exams
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	Assignments and Exams
A13	Principles of research and the application of evidence-based practice (i.e., scientific evidence, clinical expertise, and client/patient perspectives) for accurate and effective clinical decision making	Assignments and Exams
C4	Identifying, describing, and differentiating among disorders of the peripheral and central auditory systems and the vestibular system	Assignments and Exams