

CS&D 860 section 001 Syllabus *(Subject to minor changes)*

Physiological Assessment in Audiology II

Department of Communication Sciences and Disorders

Physiological Assessment in Audiology II

CS&D 860 001 (2 Credits)

2022 Fall

Description

Advanced study of physiological measures used by audiologists in threshold and diagnostic evaluations, including acoustic immittance, middle and long latency auditory evoked potentials, and P300, and MMN. Course includes an introduction to evaluation of the balance system. Enroll Info: Grad st, cons inst, Com Dis 850, 851, 852, 853, 858, 859, con reg in 861

Prerequisite(s)

Graduate/professional standing

Instruction Mode

In person

Department: Communication Sciences & Disorders

College: Letters and Science

Canvas Course URL: <https://canvas.wisc.edu/>

2022 Fall Class

Term Start Date: Wednesday 7 Sep. 2022

Term End Date: Thursday, 22 Dec 2022

Location and Schedule: GNH Distance Room: Mondays 10:00-11:40AM

CRN: 252004073

Instructor : G. Nike Gnanateja, Ph.D.

- Office: 462 Goodnight Hall
- Email: nikegnanateja.gurindapalli@wisc.edu

Office Hours

- Tuesdays 2 PM to 4 PM *(Subject to change)*

Instructor Email/Preferred Contact

1. Slack: <https://csd-classes.slack.com/archives/C04180UVCNS>
2. Email

Reader/Grader: Veronica Lane

Email: velane@wisc.edu

Methods of communication:

I will communicate with everyone on slack (*subject to change*).
 If you cannot reach me on slack, you can contact me via email.

How the Credit Hours are Met (2 Credits)

The credit standard for this course is met by an expectation of a total of ~1 hr 40 mins classroom engagement, and a minimum of 4 hours of out of class student work each week for approximately fifteen weeks (<https://kb.wisc.edu/apir/page.php?id=110511>). The out of class student engagement include but are not limited reading, studying, hands-on experiences, examinations, and other learning activities.

GRADING AND COURSE MATERIALS

Course Website, Learning Management System and Instructional Tools: Canvas

Recommended Textbooks:

- Durrant, J. D., Fowler, C. G., & Ferraro, J. A. (2020). Basic Concepts of Clinical Electrophysiology in Audiology.
- Katz, J., Chasin, M., English, K., Hood L. and Tillery, K. (Eds.). (2015). Handbook of Clinical Audiology, 7th Ed.
- Tremblay, K. (2012). Translational perspectives in auditory neuroscience : Hearing across the lifespan - assessment and disorders. Plural Publishing, Inc..

SCHEDULE (Subject to change)

| Date | Topic | Reading(s) | Assignment (if due) |
|-------------|-------------------------------------|--|----------------------------|
| 9/12 | Course logistics, review, survey | Class notes. Burkard, R., Eggermont, J., Don, M. (2007). Chapter 1: Electric and Magnetic Fields of Synchronous Neural Activity: Peripheral and Central Origins of Auditory Evoked Potentials. In Auditory Evoked Potentials: Basic Principles and Clinical Application. | Quiz 1 |
| 9/19 | Auditory middle and late potentials | Chapter will be provided Chapter 7: Testing midbrain and cortical projection pathways. In Durrant, J. D., Fowler, C. G., & Ferraro, J. A. (2020). Basic concepts of clinical electrophysiology in audiology. Plural Publishing, Incorporated. | Quiz 2 |
| 9/26 | Cortical event related potentials | Chapter 8: Cortical Level testing. In Durrant, J. D., Fowler, C. G., & Ferraro, J. A. (2020). Basic concepts of clinical electrophysiology in audiology. Plural Publishing, Incorporated. | Quiz 3 |
| 10/3 | Mismatch Negativity (MMN) and P300 | Chapter 8: Cortical Level testing. In Durrant, J. D., Fowler, C. G., & Ferraro, J. A. (2020). Basic concepts of clinical electrophysiology in audiology. Plural Publishing, Incorporated. | Quiz 4 |
| 10/10 | Auditory steady state potentials | Dimitrijevic & Cone (2015). Ch 15, Auditory Steady-State Response. Katz et al. (eds) Handbook of Clinical Audiology, 7 th edition. | Quiz 5 |
| 10/17 | Cases and Review Guest Lectures | Class Notes Musiek F. E. & Rintelmann W. F. (1999). <i>Contemporary perspectives in hearing assessment</i> . Allyn and Bacon. (Chapter will be provided) | Discussion |
| 10/24 | Student presentations | | |
| 10/31 | Student presentations | | |

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|-------|---|---|----------------------|
| 11/7 | Acoustic immittance: acoustic reflexes | Wiley T & Block MG.(1984). Acoustic and Nonacoustic Reflex Patterns in Audiologic Diagnosis, in Silman S. (ed.), <u>The Acoustic Reflex: Basic Principles and Clinical Applications</u> , New York: Academic Press, Chap. 11, 387-411. | Quiz 6 |
| 11/14 | Acoustic immittance: vector tympanometry, Acoustic immittance: multifrequency, component tympanometry | Fowler, C.G., & Shanks, J.E. (2002). Tympanometry, in J. Katz (Ed.). <u>Handbook of Clinical Audiology</u> , Baltimore: Williams & Wilkins, 5th Edition, Chapter 12. | Quiz 7 |
| 11/21 | Wideband Acoustic Immittance Cases and Review Guest Lectures | Withnell, Robert H.; Parent, Pierre; Jeng, Patricia S.; Allen, Jont B.. Using wideband reflectance to measure the impedance of the middle ear. <i>The Hearing Journal</i> : October 2009 - Volume 62 - Issue 10 - p 36,38,40-41 doi: 10.1097/01.HJ.0000361848.81466.97 | Quiz 8 Discussion |
| 11/28 | Student presentations | | |
| 12/5 | Student presentations | | |
| 12/12 | Course Wrap-up and Final Exam | | Exam |

Grading

The course is graded as follows: Quizzes= 40%, Presentation= 20%, Class Participation= 20%, Case Discussions = 10%, Exam = 10%. *Quizzes 5, 8, and Exam will be cumulative*, and will be used to assess the KASA competencies. The questions from previous units may spill over to assess long-term retention. Each quiz can be attempted ~ 3 times (additional attempts may be given based on quiz difficulty). The best grade across all attempts will be considered as the final grade for the quiz.

Quizzes: *Quizzes will be posted at 12PM on the Tuesdays of every quiz-week, and are due at 8 AM Monday morning on the following week. The quizzes are designed to assess engagement with the reading materials and class lectures. The time per quiz will vary depending on the quiz difficulty.*

Exam: *The exam will be conducted during the class period on the last Monday of the semester. The exam will be cumulative and will involve the questions about decision making for the choice of physiological tests across a wide range of case scenarios.*

ADDITIONAL READINGS

Auditory middle and late potentials

Cacace A. & McFarland D. (2015). Ch 17, Middle latency auditory evoked potentials. Katz et al. (Ed.). Handbook of Clinical Audiology, 7th edition

Kraus N, McGee TJ, & Comperatore (1989). MLRs in children are consistently present during wakefulness, stage 1, and REM sleep. *Ear Hear*, 17:419-429

Galambos, Makeig, & Talmachoff, *Proc Natl Acad Sci* 78:2643-2647

Kileny P. & Kimink, (1987). Electrically evoked middle latency auditory evoked potentials in cochlear implant candidates. *Arch Otolaryngol* 113: 1072-1077

Woods D. & Clayworth, (1986) Age related changes in human middle latency auditory evoked potentials. *Electroencephalogr and Clin Neurophysiol* 65-297-303

CORTICAL EVENT RELATED POTENTIALS (MMN AND P300)

Tremblay & Clinard. (2015). Ch 18, Cortical Auditory-Evoked Potentials Katz et al. (Ed.). Handbook of Clinical Audiology, 7th Edition.

Starr & Golob. (2007). Ch. 24, Cognitive Factors Modulating Auditory Cortical Potentials. In Burkard, Donn, & Eggermont (eds).

Polich J, Howard L, Starr A. (1985). Effects of age on the P300 component of the event-related potential from auditory stimuli: peak definition, variation, and measurement. *J Gerontol.* 40(6):721-6

- Polich & Herbst (2000). The P300 as a clinical assay: Rationale, Evaluation, and Findings. *Int J Psychophysiol* 38: 3-19.
- Naatanen, R. (1995). The mismatch negativity: A powerful tool for cognitive neuroscience. *Ear and Hearing* 16: 6-18
- Kutas & Hillyard, (1980). Reading senseless sentences: Brain potentials reflect semantic incongruity. *Science* 207: 203-205

AUDITORY STEADY STATE POTENTIALS

- Picton TW et al. (2007). Ch. 21, Audiometry Using Auditory Steady-State Responses. Burkard, Don, & Eggermont (eds).
- Rance, Rickards, Cohen, DeVidi, & Clark R, (1998). The automated prediction of hearing thresholds in sleeping subjects using auditory steady state evoked responses. *Ear Hear* 19: 48-61.
- Boettcher FA, Poth, EA, Mills, JH, & Dubno, JR. (2001). The amplitude-modulation following response in young and aged human subjects. *Hear Res*, 153(1-2), 32-42.

ACOUSTIC IMMITTANCE: VECTOR TYMPANOMETRY

- Hunter & Sanford (2015) Ch 9, Tympanometry and Wideband Acoustic Immittance, in Katz et al (eds): Handbook of Clinical Audiology, 7th edition
- Fowler, C.G., & Shanks, J. E. (2002). Tympanometry, in J. Katz (Ed.). Handbook of Clinical Audiology, Baltimore: Williams & Wilkins, 5th Edition, Ch. 12.
- Shanks, J.E., Stelmachowicz, P.G., Beauchaine, K.L., & Schulte, L. (1992). Equivalent ear canal volumes in children pre- and post-tympanostomy tube insertion, J Speech Hear Res, 35, 936-941.
- ASHA (1997). American Speech-Language-Hearing Association. Guidelines for Audiologic Screening. Rockville, MD: American Speech-Language-Hearing Association, 1. Guidelines for Screening Infants and Children for Outer and Middle Ear Disorders, Birth Through 18 Years, 15-22.
- DeChicchis, A.R., Todd, N.W., & Nozza, R.J. (2000). Developmental changes in aural acoustic admittance measurements, J Am Acad Audiol, 11(2), 97-102.
- Roup C, Wiley TL, Safady S, & Stoppenbach DT. (1998). Middle-ear screening in adults: Tympanometric norms, Am J Audiol, 7, 1-6.
- Wiley, T.W., and Fowler, C.G. (1997). Screening Applications, in Acoustic Immittance Measures in Clinical Audiology: A Primer. San Diego: Singular Publishing Group, Inc., Ch. 7.
- Nozza R.J., et al. ((1992). Towards the validation of aural acoustic immittance measures for diagnosis of middle ear effusion in children. *Ear Hear*. 13 (6): 442-453.
- Nozza R.J. et al. (1994) Identification of middle ear effusion by aural acoustic admittance and otoscopy. *Ear Hear*. 15 (4): 310-323.

ACOUSTIC IMMITTANCE: MULTIFREQUENCY, COMPONENT TYMPANOMETRY

- Fowler, C.G., & Shanks, J.E. (2002). Tympanometry, in J. Katz (Ed.). Handbook of Clinical Audiology, Baltimore: Williams & Wilkins, 5th Edition, Chapter 12.
- Calandruccio L, Fitzgerald TS, & Prieve BA. (2006). Normative Multifrequency Tympanometry in Infants and Toddlers. *J Am Acad Audiol* 17: 470-480.
- Colletti, V. (1976). Tympanometry from 200 to 2000 Hz probe tone, Audiology, 15, 106-119.
- Shanks, J.E., Wilson, R.H., Cambron, N (1993). Multifrequency tympanometry: Effects of ear canal volume compensation on static acoustic admittance and estimates of middle ear resonance. *JSHR* 36(1): 178-185
- Sprague, B., Wiley, T. L., & Goldstein, R. (1985). Tympanometric and acoustic-reflex studies in neonates, Journal of Speech and Hearing Research, 28, 265-272
- Holte, L. (1996). Aging effects in multifrequency tympanometry. *Ear Hear* 17 (1) 12-18.
- Margolis et al. (2003). Tympanometry in newborn infants—1 kHz norms. *JAAA* 14(7): 383-392.
- Zhao et al. (2002) Middle ear dynamic characteristics in patients with otosclerosis. *Ear Hear* 23 (2): 150-158.

ACOUSTIC IMMITTANCE: ACOUSTIC REFLEXES

- Feeney and Schairer SA. (2015). Ch 10, Acoustic Stapedius Reflex Measurements, in J. Katz et al. (Ed.). Handbook of Clinical Audiology, 7th edition.

Wiley TW & Fowler CG. (1997). Stapedial Reflex Measures, in Acoustic Immittance Measures in Clinical Audiology: A Primer. San Diego: Singular Publishing Group, Inc., Ch 6.

Lyon MJ. (1978). The central location of the motor neurons to the stapedius muscle in the cat, Brain Research, 143, 437-444.

Wilson RH. & Margolis RH. (1999). Acoustic-reflex measurements, in Musiek, FE. & Rintelmann, WF. (ed.), Contemporary Perspectives in Hearing Assessment, Chapter 5, 131-165.

Wiley T & Block MG.(1984). Acoustic and Nonacoustic Reflex Patterns in Audiologic Diagnosis, in Silman S. (ed.), The Acoustic Reflex: Basic Principles and Clinical Applications, New York: Academic Press, Chap. 11, 387-411.

Fowler CG & Wilson RH. (1984). Adaptation of the acoustic reflex. Ear Hear, 5, 281-288.

Hunter LL, Ries DT, Schlauch RS, Levine SC, & Ward WD. (1999). Safety and clinical performance of acoustic reflex tests. Ear Hear. 20: 506-514.

PRESENTATIONS:

You will make one presentation (20 minutes) to the class that investigates in more depth one of the topics covered in class.

Your responsibilities regarding the presentation are the following:

1. Choose your topic and have it approved by September 25.
2. One week prior to the presentation, you will email a draft copy of your powerpoint presentation to the instructor. I will review and comment on the draft and get it back to you for corrections, suggestions, etc. The presenter should also send me by slack/email 1 or 2 peer-reviewed articles on the topic. Also post these readings on the discussion board under your name so that the class members, who should read the articles are prepared to engage in a discussion of the topic on the day of presentation.
3. You will post your final finished presentation NO LATER than 8 AM the morning the presentation.
4. Members of the class should print out the presentations and have them ready by the start of the class.
5. The presentation should contain the following elements: Title page, Outline, Short literature review, case (if appropriate), and “take home points”, and references. References must be from the peer-reviewed literature, although you may use illustrations from the web.
6. At the end of the presentation, you should post some questions related to your topic so the class can discuss them.

Grading Scale:

All grades will be awarded based upon the percentage score earned. Because UW – Madison and UW – Stevens Point have different grading scales, grades will be assigned based upon the home campus of the student using the table below:

| | | | | | | | | | | | |
|----------------------------------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|
| UW – SP Letter Grade | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | F |
| 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 – Madison Letter Grade | A | A-B | | B | B-C | | C | C-D | | D | F |

Outcome Measures

By the end of the class, the student will be able to do the following:

Describe some of the advanced auditory evoked potentials, including the middle and late auditory evoked potentials and several cognitive potentials

Explain when and why these electrophysiological potentials are useful in clinical assessments

Develop an awareness to the recent advances in neurophysiological assessment procedures beyond, middle-late evoked potentials and conventional event-related potentials.

Describe advanced concepts of middle ear analysis, including multifrequency tympanometry

Describe when these measures of middle ear function are appropriate in clinical assessment.

KASA/CFCC REQUIREMENTS

The following table shows the CFCC standards that are covered in this course and indicates how they are assessed.

A passing grade is a B or better. If a student fails to complete any of the tasks listed below with a passing grade, they will work with the course instructor to either redo the task or complete an additional task to demonstrate competency with this task. If a student is not able to complete the task, then an improvement plan will be initiated to remediate the skill in question. See the Au.D student handbook section on improvement plans for further details. A passing grade for participation is a rating of 3 or higher.

| KASA & CFCC Standards | CSD 860 Physiological Assessment in Audiology II | How standard is met |
|--|--|--|
| Standard II-A: Foundations of Practice | | |
| • 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 | 860 | Students must pass Quiz 5 with a grade B or better. |
| • A5. Calibration and use of instrumentation according to manufacturers' specifications and accepted standards | 860 | Students must pass Quiz 5 with a grade B or better. |
| Standard II-C: Audiologic Evaluation | | |
| • C7. Selecting, performing, and interpreting a complete immittance test battery based on patient need and other findings; tests to be considered include single probe tone tympanometry or multifrequency and multicomponent protocols, ipsilateral and contralateral acoustic reflex threshold measurements, acoustic reflex decay measurements, and Eustachian tube function. | 860 | Students must pass Quiz 8 with a grade B or better. |
| • C11. Selecting, performing, and interpreting physiologic and electrophysiologic test procedures, including electrocochleography, auditory brainstem response with frequency-specific air and bone conduction threshold testing, and click stimuli for neural diagnostic purposes. | 860 | Students must pass Quiz 5 with a grade B or better. |
| • C13. Selecting, performing, and interpreting tests for nonorganic hearing loss. | 860 | Students must pass Quiz 5 with a grade B or better. |
| • C15. Selecting, performing, and interpreting tests to evaluate central auditory processing disorder. | 860 | Students must pass Quiz 5 and exam with a grade B or better. |
| • C16. Electrophysiologic testing, including but not limited to auditory steady-state response, auditory middle latency response, auditory late (long latency) response, and cognitive potentials (e.g., P300 response, mismatch negativity response). NEW! | 860 | Students must pass Quiz 5 and Exam with a grade B or better. |

Exam Proctoring

Exams and quizzes will be proctored in person or on canvas. Students are expected to follow the rules of the quizzes and exams and maintain highest standards of academic integrity.

Privacy of Student Records and the Usage of Audio Recorded Lectures

See information about privacy of student records and the usage of audio-recorded lectures.

Usage of Audio Recorded Lectures Statement

Lecture materials and recordings are protected intellectual property at UW- Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct

Other Course Information

ADDITIONAL COURSE INFORMATION AND ACADEMIC POLICIES

- Follow up-to-date UW-Madison prescribed policies for COVID and other contagious disorders

GENERAL COURSE POLICIES (How to succeed in this course)

Graduate school is a great time to continue refining professional skills that will serve you throughout your career.

- Arrive to class on time
- Bring a willingness to learn and be fully present (avoid doing other things during class)
- Share your own experiences
- Treat others with respect when they are sharing
- Do not video or audio record without instructor permission
- Engage with the course material through quizzes and reach to the instructor and reader-grader for improve understanding of the course material
- Written work must be your best work. Proof-read before submitting work to check for any errors (e.g., spelling, grammar, punctuation, etc.).
- Points will be deducted for inadequate work.
- Turn assignments in on time. Late assignments will not be accepted without adequate prior arrangements.
- Questions or concerns about course activities, policies, assignments (or anything else) should be referred to the instructor.

STUDENTS' RULES, RIGHTS & RESPONSIBILITIES

See: <https://guide.wisc.edu/undergraduate/#rulesrightsandresponsibilitiestext>

COURSE EVALUATIONS

UW-Madison uses a digital course evaluation survey tool called [AEFIS](#). For this course, you will receive an official email two weeks prior to the end of the semester, notifying you that your course evaluation is available. In the email you will receive a link to log into the course evaluation with your NetID. Evaluations are anonymous. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

ACADEMIC CALENDAR & RELIGIOUS OBSERVANCES

See: <https://secfac.wisc.edu/academic-calendar/#religious-observances>

ACADEMIC INTEGRITY STATEMENT

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.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES STATEMENT

The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy ([UW-855](#)) require the university to provide reasonable accommodations to students with disabilities to access and participate in its academic programs and educational services. Faculty and students share responsibility in the accommodation process. Students are expected to inform faculty [me] of their need for instructional accommodations during the beginning of the semester, or as soon as possible after being approved for accommodations. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to provide reasonable instructional and course-related accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (See: [McBurney Disability Resource Center](#))

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.

Usage of Lecture Materials

Lecture materials and recordings for CS&D 834 are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

Course Evaluations

Students will be provided with an opportunity to evaluate this course and your learning experience. Student participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

Digital Course Evaluation (AEFIS)

UW-Madison uses an online course evaluation survey tool, AEFIS. In most instances, 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. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.