

**HESP 630: Electrophysiological Measurements  
Fall 2016**

Department of Hearing and Speech Sciences,  
University of Maryland, College Park

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Meeting Time: Mondays, 3:30 – 6:00 PM  
Meeting Location: Lefrak Hall, Room 0135  
Prerequisites: HESP 606 and 706

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**COURSE SYLLABUS**

**Required Reading:**

Katz et al. (2015). *Handbook of Clinical Audiology, Seventh Edition*. Philadelphia: Lippincott Williams & Wilkins

Selected review articles

**Recommended Reading:** See articles under each topic

August 29                      Introduction; Overview of electrophysiological measurement; Patient preparation and recording tips; Neurophysiology  
*Demonstration of electrode application*

[Katz Handbook Chapter 11](#)

<http://www.asha.org/policy/KS2003-00020/>

[AAA Audiology Protocol – Electrophysiologic \(EP\) Evaluation](#)

September 12                      Neurophysiology; Instrumentation; Acquisition; Recording  
*Demonstration of Lab 1*

\* Parthasarathy, T. K., Borgsmiller, P., & Cohlman, B. (1998). Effects of repetition rate, phase, and frequency on the auditory brainstem response in neonates and adults. *J Am Acad Audiol*, 9(2), 134-140.

**Quiz 1: Due 9/19**

**Lab 1: Due 9/26**

September 19                      Principles of analysis and interpretation  
Electrocochleography  
*Demonstration of Lab 2*

## Katz Handbook Chapter 12

\*Stuermer, K. J., Beutner, D., Foerst, A., Hahn, M., Lang-Roth, R., & Walger, M. (2015). Electrocochleography in children with auditory synaptopathy/neuropathy: Diagnostic findings and characteristic parameters. *Int J Ped Otolaryngol*, 79(2), 139-145.

\*Stuermer, K. J., Beutner, D., Streicher, B., Foerst, A., Felsch, M., Lang-Roth, R., et al. (2015). The correlation between ECochG parameters and early auditory behavior after cochlear implantation in children. *Int J Audiol*, 55(7), 412-418.

Quiz 2: Due 9/26

Lab 2: Due 10/6

September 26

Differential Diagnosis  
*Demonstration of Lab 3*

## Katz Handbook Chapter 13

\*Zack-Williams, D., & Angelo, R. M. (2012). A comparison of electrocochleography and high-pass noise masking of auditory brainstem response for diagnosis of Ménière's disease. *International Journal of Audiology*, 51(10), 783-787.

\*Don, Manuel, Kwong, Betty, & Tanaka, Chiemi. (2012). Interaural stacked auditory brainstem response measures for detecting small unilateral acoustic tumors. *Audiology and Neurotology*, 17(1), 54-68.

Article Presentation 1

Quiz 3: due 10/6

Lab 3: due 10/10

October 6

**(NOTE DAY CHANGE – WILL MEET in 0104)**

Hearing Threshold Estimation – Tone-burst ABR

Katz Handbook Chapter 14  
*Demonstration of Lab 4*

\*Ferm, I., Lightfoot, G., & Stevens, J. (2013). Comparison of ABR response amplitude, test time, and estimation of hearing threshold using frequency specific chirp and tone pip stimuli in newborns. *International Journal of Audiology*, 52(6), 419-423.

\*Elsayed, A. M., Hunter, L. L., Keefe, D. H., Feeney, M. P., Brown, D. K., Meinzen-Derr, J. K., et al. (2015). Air and bone conduction click and tone-burst auditory brainstem thresholds using Kalman Adaptive

Processing in nonsedated normal-hearing infants. *Ear Hear*, 36(4), 471-481.

**Quiz 4: due 10/10 (Posted 10/3)**

October 10

Peak-picking practice, Pediatric Clinical Applications, Review for midterm

**Lab 4: due 10/24**  
**Article Presentation 2**

\*Stevens, John, Boul, Alison, Lear, Samantha, Parker, Glynnis, Ashall-Kelly, Katie, & Gratton, Denise. (2013). Predictive value of hearing assessment by the auditory brainstem response following universal newborn hearing screening. *International Journal of Audiology*, 52(7), 500-506.

October 17

Midterm (Take-home exam due 11:59 pm on 10/20/16)

October 24

Auditory Steady-State Response

*Demonstration of Lab 5*

**Katz Handbook Chapter 15**

\*Hatton, J., & Stapells, D. R. (2011). The efficiency of the single-versus multiple-stimulus auditory steady state responses in infants. *Ear and Hearing*, 32(3), 349-357.

\*Beck, R. M. d. O., Grasel, S. S., Ramos, H. F., Almeida, E. R. d., Tsuji, R. K., Bento, R. F., et al. (2015). Are auditory steady-state responses a good tool prior to pediatric cochlear implantation? *International Journal of Pediatric Otorhinolaryngology*, 79(8), 1257-1262.

**Lab 5: due 11/7**  
**Quiz 5: due 10/31**  
**Article Presentation 3**

October 31

Intraoperative neurophysiological monitoring

**Katz Handbook Chapter 16**

\*Attias, J., Nageris, B., Ralph, J., Vajda, J., & Rappaport, Z. H. (2008). Hearing preservation using combined monitoring of extra-tympanic electrocochleography and auditory brainstem responses during acoustic neuroma surgery. *International Journal of Audiology*, 47(4), 178-184.

Quiz 6: Due 11/7  
Lab 6: Due 11/14

#### Article Presentation 4

November 7

Central auditory processing, Part I – cABR/FFR

Skoe, E., & Kraus, N. (2010). Auditory brain stem response to complex sounds: A tutorial. *Ear & Hearing*, 31(3), 302-324.

\*Rocha-Muniz, Caroline N, Befi-Lopes, Debora M, & Schochat, Eliane. (2012). Investigation of auditory processing disorder and language impairment using the speech-evoked auditory brainstem response. *Hearing Research*, 294(1), 143-152.

Kraus, N., & Anderson, S. (in press). Auditory Processing Disorder: Biological basis and treatment efficacy. In R. R. Fay & A. N. Popper (Eds.), *Translational Research in Audiology and the Hearing Sciences: An Essential Guide for Scientists and Clinicians* (Vol. Springer Handbook of Auditory Research, pp. 299-318). New York: Springer.

#### Article Presentation 5

Quiz 7: Due 11/14  
Lab 7: Due 11/21

November 14

Central auditory processing, Part II – Middle Latency Response

#### Katz Handbook Chapter 17

\*Weihing, J., Schochat, E., & Musiek, F. (2012). Ear and electrode effects reduce within-group variability in middle latency response amplitude measures. *International Journal of Audiology*, 51(5), 405-412.

#### Article Presentation 6

November 21

Central auditory processing, Part III – Cortical Auditory-Evoked Potentials

#### Katz Handbook Chapter 18

\*Almeqbel, A., & McMahon, C. (2015). Objective measurement of high-level auditory cortical function in children. *Int J Pediatr Otorhinolaryngol*, 79(7), 1055-1062.

\*Anderson, S., Chandrasekaran, B., Yi, H.-G., & Kraus, N. (2010). Cortical-evoked potentials reflect speech-in-noise perception in children. *European Journal of Neuroscience*, 32(8), 1407-1413.

**Article Presentation 7**

**Quiz 8: Due 11/28**

**Lab 7: Due 12/5**

November 28

**Challenging populations: Management of CIs and hearing aids using evoked potentials**

\*Munro, Kevin J, Purdy, Suzanne C, Ahmed, Sadia, Begum, Rushanara, & Dillon, Harvey. (2011). Obligatory cortical auditory evoked potential waveform detection and differentiation using a commercially available clinical system: HEARLab™. *Ear and Hearing*, 32(6), 782-786.

\*Cardon, G., & Sharma, A. (2013). Central auditory maturation and behavioral outcome in children with auditory neuropathy spectrum disorder who use cochlear implants. *International Journal of Audiology* (0), 1-10.

\*Easwar, V., Purcell, D. W., Aiken, S. J., Parsa, V., & Scollie, S. D. (2015). Evaluation of speech-evoked envelope following responses as an objective aided outcome measure: Effect of stimulus level, bandwidth, and amplification in adults with hearing loss. *Ear Hear*, 36(6), 635-652.

December 5

**Objective assessment of treatment efficacy**

**Anderson, S., & Jenkins, K. (2015). Electrophysiologic assessment of auditory training benefits in older adults. *Semin Hear*, 36(04), 250-262.**

\*Anderson, S., White-Schwoch, T., Parbery-Clark, A., & Kraus, N. (2013). Reversal of age-related neural timing delays with training. *Proceedings of the National Academy of Sciences - USA*, 110(11), 4357-4362.

\*Filippini, R., Befi-Lopes, D. M., & Schochat, E. (2012). Efficacy of Auditory training using the auditory brainstem response to complex sounds: auditory processing disorder and specific language impairment. *Folia Phoniatica et Logopaedica*, 64(5), 217-226.

**Article Presentation 8**

December 12

**Discussion of case studies; Review for final**

December 12-19

**Practical final exam**

December 19

**FINAL EXAMINATION (In Class)**

## **Grading System**

Summary of point system:

Labs: 25 points each	7 labs x 25 pts =	175
Quizzes: 20 points each	8 quizzes x 20 pts =	160
Article presentations: 25 points each	1 article =	25
Midterm: 150 points	1 midterm =	150
Final: 175 points (25 practical, 150 written)	1 final =	<u>175</u>
		750

## **University of Maryland grade policy**

<b><u>Percentage of Possible Points</u></b>	<b><u>Course Grade</u></b>
.980-1.00	A+
.930-.979	A
.900-.929	A-
.870-.899	B+
.830-.869	B
.800-.829	B-

## **Learner Outcomes**

This course covers the clinical use of electrophysiological methods for assessment, diagnosis, and management of individuals who may have peripheral or central hearing loss.

1. Administration and interpretation of various electrophysiological measures including ABR, ASSR, MLR, LLR, and cABR/FFR. Other measures, such as ECoChG, Stacked ABR, and CHAMP, will be discussed.
2. Use of ABR and ASSR for estimation of hearing thresholds in infants and other individuals who are difficult-to-test.
3. Use of ABR, ECoChG, Stacked ABR, and CHAMP for the diagnosis of conductive/SNHL/retrocochlear pathology.
4. Use of cABR/FFR, MLR, and LLR in assessment of auditory processing and brain injury.
5. Use of LLR/FFR to evaluate cochlear implant and hearing aid function in infants and individuals who are difficult to test.
6. Use of cABR/FFR, MLR, and LLR to evaluate effects of treatment.

## Formative Assessments

- 1. Exams:** A mid-term and a final examination will be given. Exam questions will come from class lectures and assigned chapters. In addition to the written exam, the final will also include a practical exam. Details will be provided later in the course.
- 2. Online Reading Quizzes:** Students are expected to be familiar with the assigned readings prior to coming to class. Each student will be required to complete 8 quizzes on the course ELMS site that cover lecture content and readings from the textbook. These quizzes are “open-book” in that students have access to the text while taking the quiz. The students will have one week to complete the quiz. The quizzes are timed – but you will have 4 hours to complete it. Once you’ve started the quiz, you must finish it – you can’t go back to it later.
- 3. Article Presentations:** Student will choose one article from the syllabus and will prepare and present powerpoint slides that summarize the article’s introduction, method, results (review each figure), and discussion. In addition, students will critique the article, suggest ways to improve the research, and propose a new research question. The presentation should not exceed 15 minutes. A grading rubric will be posted on ELMS.
- 4. Practical Lab Exercises and Reports:** Students will be required to complete practical lab assignments using various electrophysiology protocols and to submit a report for each lab. See the course ELMS site for more specific information on these assignments.

## Guidelines for Practical Lab Exercises & Reports

The lab exercises are designed to help you put into practice the concepts and procedures we cover in class. Handouts outlining instructions for the test procedures and reports can be obtained on ELMS.

### Lab Reports

You must follow all guidelines for written work listed in this syllabus. The typed portion of the lab report should be limited to one page or less. Please submit all assignments in electronic format online by midnight on the due date. Although you may consult your textbooks and other resources, including your classmates, as you work on each lab, please make sure your write-up is your own. Three points will automatically be deducted from your lab grade for every day the report is late. The labs will cover the following topics:

Lab #1: Recording parameters I	due September 26
Lab #2: Recording parameters II	due October 6
Lab #3: Conductive HL, electrode montage	due October 10
Lab #4: Threshold estimation using tonebursts	due October 24
Lab #5: ASSR	due November 7
Lab #6: cABR	due November 14
Lab #7: Cortical	due November 21

### Questions/Difficulties

Please contact me as soon as possible if you have difficulties with or questions about a particular lab assignment, so that they can be resolved in plenty of time for you to complete the lab by the due date,

and so that you have a better understanding the relevant concepts prior to exams. If there are any equipment problems or malfunctions, the due dates will be extended.

## University Policies

### Academic Integrity

The University administers an Honor Code and an Honor Pledge, available on the web at <http://www.bsos.umd.edu/for-students/advising/academic-integrity-honor-pledge-and-legal-aid-.aspx>.

The Code prohibits students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers submitting fraudulent documents, and forging signatures. Students are requested to write the following signed statement on each examination or assignment: "I pledge on my honor that I have not given or received any unauthorized assistance on this examination (or assignment)." Compliance with the code is administered by a Student Honor Council, which strives to promote a "community of trust" on the College Park campus. For additional information, see the Office of Judicial Programs and Student Ethical Development website: <http://roberson.rutgers.edu/studentlife/conduct.html>.

### Accommodations for Students with Disabilities

If you have a documented disability and wish to discuss academic accommodations with me, please contact me before September 19<sup>th</sup>. If necessary, please contact the Disability Support Service (301-314-7682) for assistance in determining and implementing appropriate academic accommodations.

### Confidentiality-Posting Grades

The University complies with the regulations set forth in the Buckley Amendment. The amendment protects the student from the disclosure of personal and academic information to anyone other than the student, including parents, except under special circumstances. Posting student grades with either student names or social security numbers-in whole or in part-*is strictly prohibited*. Grades will be available on ELMS or directly from the instructor.

### Religious Observances

The University System of Maryland policy on religious observances provides that students *should not be penalized because of observances of their religious beliefs; students shall be given an opportunity, whenever feasible, to make up within a reasonable time any academic assignment that is missed due to individual participation in religious observances*. I will make every feasible effort to accommodate students' requests based on attendance of religious observances. *It is the student's responsibility to inform me of any intended absences for religious observances in advance. Notice should be provided as soon as possible but no later than the end of the schedule adjustment period*. Prior notification is especially important in connection with final examinations, since failure to reschedule a final examination before the conclusion of the final examination period may result in loss of credits during the semester. To review the University's policy or view a variety of other religious holidays, see <http://www.bsos.umd.edu/for-faculty-and-staff/faculty-resource-guide/faculty-responsibilities-inside-the-classroom-/canceling-classes.aspx> for further details.



## **Online Course Evaluation, Fall 2016**

Your participation in the evaluation of courses through CourseEvalUM is a responsibility you hold as a student member of our academic community. Your feedback is confidential and important to the improvement of teaching and learning at the University. Please go directly to the website ([www.courseevalum.umd.edu](http://www.courseevalum.umd.edu)) to complete your evaluations. By completing all of your evaluations each semester, you will have the privilege of accessing online, at Testudo, the evaluation reports for the thousands of courses for which 70% or more students submitted their evaluations.

## **Flu and other illnesses**

The University of Maryland is concerned for the health of members of the University community. However, we are also concerned about the possibility that widespread illness could disrupt the academic enterprise of the University. If you have flu-like symptoms, please stay home and seek medical attention. You should return to classes only after your fever and symptoms have abated for 24 hours. I will follow the same policy. To continue the teaching/learning environment of our class even if you or I are absent, and/or classes are canceled, I plan to implement several contingencies this year:

1. I will communicate with all of you via ELMS if class is canceled for any reason;
2. I ask you to communicate with me if you are sick and will miss class;
3. I will post all ppt presentations to ELMS;
4. I will provide a panopto recording of all classes.
5. If class is canceled due to a weather emergency, we will hold class at the usual time online through ELMS. If that is unsuccessful, we will schedule another class.

## **ELMS Course Website/ Course Readings**

Students must log on regularly to their ELMS accounts in order to fully participate in this class. Please plan to check the site frequently for announcements. The class site will include the syllabus, the course reading list, course content, information on and instructions for assignments, and grade postings.

There are a number of readings for the course, including chapters from the text and original journal articles. Students are expected to be familiar with the assigned chapters prior to coming to class and to be prepared to discuss the chapters during class.

*If you have not previously used Elms, information on Elms and on how to logon is provided at the following website: under "Student Resources". If you do not have access to a personal computer at home, you can access the Internet and your ELMS page at one of the open workstation laboratories on campus. Information on the location of open workstation laboratories and hours of operation can be found at <http://www.oit.umd.edu/wheretogo> or by contacting the Office of Information Technology (OIT) Helpdesk (for more information, see <http://www.helpdesk.umd.edu>).*

## **Written Work**

All written work submitted for this course should be treated as a formal assignment. Students should take the same care as they would with a term paper, including proper spelling and grammar, use of complete sentences, clear and precise explanation of points, and provision of support for their arguments, including proper citation of referenced works. Use APA style (6<sup>th</sup> edition) followed for writing, citations, and reference lists. All written work should be submitted electronically unless otherwise noted.

### **Make-up Exams/Assignments**

If a student is aware ahead of time that he/she will be absent on the day of an exam, the student may schedule a make-up exam provided that (1) the student has an approved University Acceptance (e.g., religious observance) and (2) the instructor is notified in writing within the first two weeks of the semester (by February 8). Assignments are expected to be submitted by the dates indicated on the syllabus or in advance of the due date if the student anticipates being absent from class on the due date. The student should inform the instructor that he/she will be absent ahead of time to make arrangements to submit the assignment.

When the reason for an absence on the day of an exam or assignment is not foreseeable, the student must inform the instructor as soon as possible. Please make every effort to contact the instructor by phone or by email prior to class if you will be absent due to illness or other emergency. Campus Senate policy requires students who are absent due to illness/injury to furnish documentary support to the instructor. You must provide written documentation verifying your illness/injury on the day that you return to class. You will not be allowed to turn in missed assignments or make up exams if you have not provided this documentation. In addition, if it is found that you have falsified the documentation provided, you will be referred to the University's Student Conduct Office.

Make-up exams will be scheduled at a time that is mutually agreeable to both the instructor and the student. Assignments are due immediately by electronic submission if possible or upon the student's return to school. All missed exams and assignments not turned in will result in a grade of zero for that exam/assignment.

### **Problems/Questions**

Please do not hesitate to make an appointment to speak with me if you are having difficulty with the material or with an assignment, if you have questions about how something was graded, or if you have other problems or issues related to the course you wish to discuss. Email is an excellent way to reach me outside of course meetings.

**HESP 630****FORMATIVE ASSESSMENTS**

Student \_\_\_\_\_

Semester: FALL 2016

**ASHA Standard****Method of Assessment** (denoted by \*)**Verification of Assessment** (denoted by ✓)

No.	Title	Exam questions	Lab Assignments
B2	Patient characteristics and how they relate to clinical services	*	*
B4	Anatomy and physiology, pathophysiology and development of the auditory system	*	*
B12	Infectious/contagious diseases and universal precautions		*
B20	Laws, regulations, policies and management practices relevant to the profession of audiology	*	*
C4	Screen individuals for hearing impairment and disability/handicap using clinically appropriate and culturally sensitive screening measures.	*	*
D7	Perform audiologic assessment using physiologic, psychophysical and self-assessment measures	*	*
D8	Perform electrodiagnostic test procedures	*	*
D11	Document evaluation procedures and results		*
D12	Interpret results of the evaluation to establish type and severity of disorder	*	*
D13	Generate recommendations and referrals resulting from the evaluation process	*	*
D15	Maintain records in a manner consistent with legal and professional standards		*

Instructor Signature: \_\_\_\_\_

Samira Anderson, Au.D., Ph.D.