



*Understanding the auditory processing of both the living and the dead will keep you alive in any type of zombie pandemic.*

### What will you learn in this class?

A deep understanding of the anatomy and physiology of the auditory and vestibular systems are crucial for correct clinical diagnoses (on both living and dead patients).

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

- Have knowledge of anatomy and physiology, pathophysiology and embryology, and development of the auditory and vestibular systems.
- Have knowledge of normal aspects of auditory physiology and behavior over the lifespan.
- Be able to fit a hearing aid or cochlear implant on a zombie.
- Make clinical recommendations that best serve the undead.
- Keep yourself alive in any type of zombie apocalypse.

## Who We Are

### About Us

We know it is all a matter of time. So do you.  
Time to get ready.

### Contact Us

Phone: x5-8852  
Email: [goupell@umd.edu](mailto:goupell@umd.edu)  
Office: 2134 Lefrak (LEF) Hall

The best way to contact me is by email. But responses often take more than 24 hours.

My Office Hours:  
By appointment. Questions will mostly be answered in class.



## ZOMBIE PANDEMIC SURVIVAL GUIDE

*Hearing and Speech Sciences  
634: Anatomy and Physiology  
of the Auditory and Vestibular  
Systems*



**ZOMBIE PANDEMIC  
SURVIVAL GUIDE**



## Why study the dead?

### Early experiments on the human cochlea in cadavers leads the way

Ever since von Bekesy measured cochlear tuning in human cadavers, it has been highly important to understand how the living and the dead are different in their neural processing of sensory stimuli. Such knowledge will give you the ability to determine whether it is better to hide or run or stand your ground in any given zombie-related emergency. It is well-known that zombies critically rely on their auditory system to find living things to eat. Don't become one of them.

### Textbooks

Suggested Course Textbook:

**(I recommend reading the textbook, but it is not officially required)**

**Musiek and Baran (2018). *The Auditory System: Anatomy, Physiology, and Clinical Correlates*. 2<sup>nd</sup> Edition**

ISBN-13: 978-1944883003

ISBN-10: 1944883002

Note: either edition will be acceptable for class

Optional Textbooks:

**Verstynen and Voytek (2016). *Do Zombies Dream of Undead Sheep?: A Neuroscientific View of the Zombie Brain***

A popular presentation of neuroscience, which is much more cortical and less auditory system focused than our other texts.

**Pickles (2013). *An Introduction to the Physiology of Hearing*. 4<sup>th</sup> Edition**

ISBN-13: 978-9004243774

A generally good textbook, which has more advanced auditory neurophysiology.

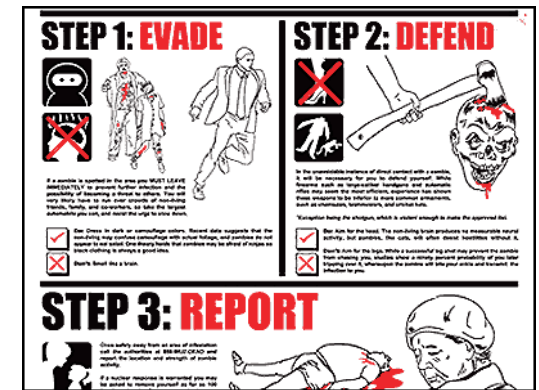
**Clark and Ohlemiller (2007). *Anatomy and Physiology of Hearing for Audiologists*.**

ISBN-13: 978-1401814441

Also a generally good textbook, although organized much differently than the class. Still would be a good resource for future audiologists and hearing scientists.

---

*"You walk outside, you risk your life. You take a drink of water, you risk your life. Nowadays you breathe and you risk your life. You don't have a choice. The only thing you can choose is what you're risking it for. We're all infected."*



The CDC and NIH, in a joint collaboration, have made undead hearing a major priority. Don't miss out on funding opportunities, or those that will keep you alive.

If you haven't caught yourself up on the most recent zombie-related materials, feel free to watch:

- The Walking Dead
- 28 Days Later, 28 Weeks Later
- Shawn of the Dead
- Dawn of the Dead
- Evil Dead I and II
- Army of Darkness
- Resident Evil
- Black Sheep
- Etc...

# COURSE SCHEDULE

| Day  | Date           | Lecture Number | Topics Covered                                          | Recommended M&B | Optional Pickles Reading |
|------|----------------|----------------|---------------------------------------------------------|-----------------|--------------------------|
| Mon  | July 21, 2025  | --             | Introduction to Class, Review Syllabus and Expectations | --              | --                       |
| Tues | July 22, 2025  | 1              | Outer Ear, Middle Ear                                   | 1-3             | 2                        |
| Wed  | July 23, 2025  | 2              | Anatomy of the Inner Ear                                | 3, 4            | 3                        |
| Thur | July 24, 2025  | --             | Asynchronous Work Time, Virtual Office Hours            | --              | --                       |
| Fri  | July 25, 2025  | 3              | Cochlear Mechanics                                      | 5               | 3                        |
| Mon  | July 28, 2025  | 4              | Intro to Cell Biology, Cochlear Electrophysiology       | 6               | 5                        |
| Tues | July 29, 2025  | 5              | Peripheral Vestibular System, Intro to Neurons          | None            | None                     |
| Wed  | July 30, 2025  | 6              | Auditory Nerve                                          | 7               | 4                        |
| Thur | July 31, 2025  | 7              | Auditory Nerve, Cochlear Nucleus                        | 8               | 6A-B                     |
| Fri  | August 1, 2025 | --             | Asynchronous Work Time, Virtual Office Hours            | --              | --                       |
| Mon  | August 4, 2025 | 8              | Superior Olivary Complex                                | 9               | 6C                       |
| Tues | August 5, 2025 | 9              | LL, IC, MGB, Thalamus, Cortex                           | 10-13           | 6D-I, 7                  |
| Wed  | August 6, 2025 | 10             | Efferent System                                         | 15              | 8                        |
| Thur | August 7, 2025 | --             | Class Review                                            | --              | --                       |
| Fri  | August 8, 2025 | --             | No class!!!                                             | --              | --                       |

## Broad Course Overview and Expectations

- There are two sections of the course, an **asynchronous** portion of class that is done outside of the scheduled lecture time that help you prepare for the **synchronous** portion of class.
- The typical work for a 3 credit class is about 135 hours (3 credits x 3 hours/credit/week x 15 weeks). Keep that in mind when an entire 3-credit class is compressed into 3 weeks, which translates to about 45 hours/week.
- The setup of the class is to **[asynchronously]** introduce material (read the textbook), reinforce (watch Panopto lectures), reinforce (take low-stakes online quizzes), and **[synchronously]** synthesize and consolidate (group quizzes, class discussion, surviving zombies).
- The more you and the entire class prepares/reviews for each **synchronous** portion of class, the better the class will be. The **synchronous** class is driven by student questions and discussion.
- By the way,
  - while it is important to take learning this material seriously, and the academy is often a place full of people who are very serious,
  - realize that this is a class where you should not take yourself too seriously... because the instructor never takes himself that seriously... especially in the summer... and even more especially in a 3-week summer anatomy and physiology class.

## Asynchronous Portion of Class

- Class Material
  - Our goal is to understand how zombies hear, in case of a zombie pandemic.

- Anatomy and physiology that is relevant to hearing loss and cochlear implants will also be discussed.
- Broader (non-auditory) aspects of neuroscience will be covered to better understand the important role of hearing in surviving zombie attacks.
- Finally, there is some basic knowledge that you need about signals, systems, and instrumentation to understand this course. Therefore, we will review this material as a part of this class. You should contact me if you have not taken a course like HESP600: Instrumentation so we can come up with an appropriate plan.
- Recommended Textbook
  - The recommended reading load is quite uneven across the weeks (6, 2, 5 chapters).
  - Optional texts are also provided for supplementary learning/clarification.
  - I recommend you read the Musiek and Baran **before class** carefully, thoughtfully, and without distraction. This is a skill that graduate students develop and that most undergraduates do not have.
  - The purpose is to introduce ideas and terminology, so you are better able to receive them in my lectures.
- PPT slides/Lecture Videos
  - A lot of asynchronous lectures via Panopto are available for you to watch, ideally before class.
- Exercises/Quizzes
  - Online factual quiz questions based on the textbook and the class will be available for you to attempt, ideally before class.
  - They are based on the material in the textbook and Panopto videos.
  - They are low-stakes, meaning you can retake them until you get all the correct answers. Most people watch a lecture, take the quiz, and if they get an incorrect answer, they go back to the lecture/slides to fix their answer.
  - Because I realize that not everyone will have the exact same schedules, all the deadlines for the week are **the Sunday after** the material is covered. Ideally it will be done much earlier (before class or right after class each day), but I am giving you all flexibility to get the work done.
- Other Preparation
  - Recopying information and notes is important for understanding and consolidation of learning. I expect you to do something like this as preparation for questions for the **synchronous** portion of class.
  - Posting questions on the discussion board ahead of class time and generating discussions student-to-student and student-to-instructor are highly encouraged and expected. Questions sent directly via email to Dr. Goupell will be pasted to the discussion board and answered there. I would prefer that you just go directly to the discussion board.

### **Synchronous Portion of Class**

- There will be 10 classes where we play a zombie role-playing game and try to answer more difficult questions that require synthesis of the material.
- Each class will be about 2 hours.
- Part 1: Class may start with reviewing the systems quiz question and group quiz questions from the previous day, pending that all the submissions are in. If not, we will push these until all submissions are in, or at the latest the following Monday of class.
- Part 2: Class will then go over any questions and clarifications from the textbook and Panopto recordings (see above about giving me some forewarning using the discussion boards). This is the part where your involvement and engagement are critical for a good class.
- Part 3: After the general questions have been answered, we will start the in-class exercise portion, which is also a role-playing/choose-your-own-adventure game.
- People may need to use this website to virtually roll dice (room name=zombiehearing):  
<http://rolldicewithfriends.com/rooms/zombiehearing>

- This portion will have in-class group exercises, designed to be more difficult and relevant to zombie hearing. They are intended to practice critical concepts and provide an opportunity for critical thinking.
- In-class questions will be answered in groups and submitted via ELMS.
- Groups for the in-class exercises will self-select based on the decisions their characters make during the adventure. In-class exercises can be resubmitted after class.
- It is critical to avoid outside distraction during class:
  - Virtual communication environments are prone to distraction; don't become a technology zombie!
  - Email and other internet browsing should be turned off
  - All other distracting applications/notices on your computer will be turned off
  - Social media is right out!
  - Turn off or silence your phone
- If necessary, private communication with the instructor will be done via private message in Zoom because my phone and email will be turned off. In cases where you are having a major technology failure, you can email me.
- A short break about 1 hour into the class will be given.

#### **Attendance:**

- Attendance to class is not required. However, I hope you all prioritize class if possible, as I view the **synchronous** class portion and interaction an important part of consolidating the material.
- At the same time, realize the most important thing is that you learn the material. So, it is 100% possible to do that without attending any of the **synchronous** classes; I just recommend against that approach if possible.
- If you miss class, you can work with other students on group quiz questions. In general, we will try to keep to the deadlines for the assignments.
- Please email me if you won't be attending class for my records (like if you are going to Africa).
- I realize that circumstances may interfere with attendance at a given class. These include:
  - Zombie bites and other health-related circumstances
  - Zombie equipment destruction and other technology failures
  - Traveling to Africa
- Excused absences do not include:
  - Family vacations to tropical locations and similar trips. If you are at the beach, you had better make sure there is a good internet connection.
- Please inform me ahead of time about excused absences for missing class/quizzes/exams due to illness, family emergencies, religious observances, inclement weather, etc. so that I can try to accommodate your situation.
- My policy is always to be flexible, within reason.

#### **Synchronous Class and Discussion Board Participation:**

- Class participation is highly encouraged in the form of questions and participating in the game, which requires student-to-student and student-to-instructor interaction and cooperation. It is the only way you will survive this class. EXP can and will be deducted for clear cases of non-class compliance.
- Discussion board participation is also highly encouraged. It also allows me to jump into the conversation if necessary.
- 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, the teaching assistants, 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.
- A hybrid option can be made available in exceptional circumstances.

### **Exercises, Quizzes, and Grading:**

- Online quizzes/exercises: Many of the quizzes on ELMS are automatically computer graded. These quizzes can be taken as many times as desired/necessary.
- Signals and Systems Questions: Are intended to be review for anyone in the AuD program and will not be graded. But they should be attempted.
- Discussion Board Posts: Everyone will post one content question per chapter that does not overlap with other students' questions.
- Synchronous quizzes/exercises: Will be submitted during class, during the adventure and graded by me (us). Students can resubmit these exercises, ideally after class, given the frantic nature of the synchronous portion of the class.

### **Grades (percentage of total EXP available in class, estimated to be around 800 total EXP)**

- Grades in this class are associated with experience points or EXP.

|           |          |           |
|-----------|----------|-----------|
|           | A: >93   | A-: 90-92 |
| B+: 90-87 | B: 83-86 | B-: 80-82 |
| C+: 80-77 | C: 73-76 | C-: 70-72 |
| D+: 70-67 | D: 63-66 | D-: 60-62 |
| F: <60    |          |           |

# Gaining Experience Points (EXP)

Grades in this class are associated with experience points or EXP.

## Online Quizzes/Exercises

- ELMS Multiple Choice – entered only online, can be taken as many times as you want/need, these are formative assessments
- ELMS Signals and Systems question – usually involves some math and drawing, can be submitted only once

## In Class Role-Playing Adventure

- Some of the points are associated with answering questions during the class
- These are intended to be answered during class
- Can be resubmitted to fix any mistakes that occurred during the heat-of-the-moment learning

All quizzes/exercises are due Sunday after the lectures, which gives you time to ask questions during class.

There will be no final exam or assessment for this class. You are in charge of your own consolidation of learning, which will be critical for success in future classes.

## Other actions that award EXP

- Notable participation in the RPG (+2 EXP)
- Acting in character (+1 EXP)
- Good judgment (+1 EXP)
- Daring or heroic action, whether clever or not (+1 EXP)
- A clever or useful action (+1 EXP)
  - Related to anatomy & physiology of the auditory system (+2 EXP)
- A critical plan that saves character's life and/or a few friends (+2 EXP)
  - Related to anatomy & physiology of the auditory system (+4 EXP)
- A critical plan that saves large group or many people (+4 EXP)
  - Related to anatomy & physiology of the auditory system (+8 EXP)
- Deductive reasoning and/or insight (+2 EXP)
  - Related to anatomy & physiology of the auditory system (+4 EXP)
- Killing or subduing a zombie (+3 EXP)
- Killing or subduing a major menace (+20 EXP)
- Maximum EXP for any class is +20 EXP

## Penalizing actions that reduce EXP

- Not participating in the game (-5 EXP)
- Not answering questions posed by other students or the instructor (-5 EXP)
- Clear instances of not paying attention because of email, phones, social media will be documented by the instructor and discussed outside of class (-5 EXP)
- Disrespectful or distracting behavior to other students or the instructor (varies depending on the action, can be up to -50 EXP)

### **University Emergency Closing:**

I'm not sure how this is relevant for an online class, but in the event that the University is closed for an emergency or extended period of time, I will communicate to you via email to indicate schedule adjustments, including rescheduling of examinations and assignments due to inclement weather and campus emergencies. Official closures and delays are announced on the campus website <http://www.umd.edu>. The snow phone line is 301-405-SNOW, as well as local radio and TV stations.

### **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.

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 by the end of the second week of class. I will reschedule the exam for the entire class to a more appropriate date.

### **Copyright:**

Class lectures and other materials have a copyright and 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.

### **Course Contributions:**

- Matthew J. Goupell designed the course and implemented its current form with help from others.
- Season 3 of Walking Dead and Mary Barrett were the original impetus for turning this class into a zombie hearing class.
- Anna Tinnemore was the reason to go far down the zombie neuroscience road.
- The idea for the role-playing game came from the excellent other zombie class on campus by Prof. Chantel Rodríguez. HIST289Y - Why Do We Fear Zombies?: A Cultural History of the Living Dead
- Mary Barrett, Anne Tinnemore, and Paul Mayo were all instrumental in transforming this class to a flipped and virtual classroom, including much help with the assessments.
- Theodore Carter and Mike Thompson consulted on the story and role-playing elements of the course.
- Alanna Schloss was the design artist who made the "Choose Your Own Adventure" cover and the chapter figures.
- The role-playing system is based on "Heroes Unlimited" by Palladium Games.

# LEARNING OBJECTIVES AND OUTCOMES

## HESP 634: ANATOMY AND PHYSIOLOGY OF THE AUDITORY AND VESTIBULAR SYSTEMS

STUDENT NAME:

SEMESTER COMPLETED: Summer 2025

| Title                                                                                                        | Exam/quiz Questions | Achieved |
|--------------------------------------------------------------------------------------------------------------|---------------------|----------|
| <b>3.1.2A FOUNDATIONS OF AUDIOLOGY PRACTICE</b>                                                              |                     |          |
| Embryology, anatomy, and physiology of the auditory, vestibular, and related body systems                    | *                   |          |
| Effects and role of genetics in auditory function, diagnosis, and management of hearing loss                 | *                   |          |
| Effects and role of genetics in vestibular function, diagnosis, and management of vestibular disorders       | *                   |          |
| Effects of pathophysiology on the auditory, vestibular, and related body systems                             | *                   |          |
| Medical and surgical interventions that may be used to treat the results of pathophysiology in these systems | *                   |          |

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: