Course Requirements and Grading:

There will be approximately 1 quiz per week worth 5 – 10 pts. There will be a final Exam worth 100 -130 pts. The oral presentation is worth 25 pts.

Texts:

The primary text will be “The Auditory System: Its Anatomy, Physiology and clinical correlates (Musiek & Baran). You also need to have ready access to:

- Gelfand, Hearing: Physiological and Psychological Acoustics (any edition)
- Moller, Hearing: Its Physiology and Pathophysiology (any edition)
- Musiek, Baran, Shinn, Jones: Disorders of the Auditory System

Resources:

WEB CT will have Anatomy and Physiology slides
There are a number of WEB SITES for anatomy of the auditory system –visit them!

Reference lists in Musiek & Baran for additional reading and investigation.

Extra Credit:

Extra credit is possible – needs to be approved by instructor.

Academic Misconduct:

Academic Honesty: The Student Conduct Code states that "A fundamental tenet of all educational institutions is academic honesty; academic work depends upon respect for and acknowledgement of the research and ideas of others. Misrepresenting someone else's work as one's own is a serious offense in any academic setting and it will not be condoned." It further states that, "A student who knowingly assists another student in committing an act of academic misconduct shall be equally accountable for the violation." See http://www.dosa.uconn.edu/Code2.html for more information on the University's student code.

Plagiarism is the most extreme form of Academic Dishonesty and will result in failing this course and possible removal from the university. Plagiarism: (from the Latin plagiarus, an abductor, and plagiare, to steal): Plagiarism is defined as presenting another person's work or ideas as one's own.

Learning Outcomes

1. Students will be able to outline key structures of the peripheral and central auditory systems in ascending fashion.
2. Students will be able to discuss the physiological processing of intensity, frequency and time in both the peripheral and central auditory systems.
3. Students will be able to identify from models and actual specimens key structures of the peripheral and central auditory systems.
4. Students will be able to discuss the influence of pathology on both peripheral and central auditory mechanisms.

**Agenda:**

**08/25-27**
Overview of the course and the need for understanding structure and function of the auditory system for audiology.

Cell biology: a snapshot

Overview of anatomy & physiology of the auditory system.
- anatomical planes
  - Outer ear: funneling ?,
  - Localization, head shadow effect
  - Freq. bias, & resonance of outer ear
- Middle ear: anatomy, vibration patterns of TM, area ratio, lever ratio
  - Transformer action
  - Bone conduction: modes of B/C
  - Pathophysiology of the conductive mechanism
  - Acoustic reflex
Readings: Musiek & Baran, ch. 1, pp. 1-17, ch. 3

**09/1-3**
No classes 9/1, 9/3 Con’t from 8/27

The cochlea: anatomy (gross and fine structure), characteristics of the traveling wave, and cochlear mechanics, cochlear electrophysiology, frequency and intensity coding, outer hair cells, biological amplifier, OAEs, non linearity, recruitment. Microscope Slide review.
Readings: Musiek & Baran, ch. 4, 5, & 6; Gelfand, ch. 4, Moller, pp. 75-76, 96-99.

**09/8-10**
Cochlear function con’t. Microscope slide review
Readings: same

**09/15-17**
Cochlear electrophysiology and pathophysiology, ECP, CM, SP, NIHL, hydrops, recruitment, tinnitus.
Readings: same; Moller, pp 396-398, 409-418, 422-428, 461-472

**09/22-24**
Finish cochlea, start Auditory Nerve; The nerve cell anatomy, IAM, tonotopic arrangement, frequency coding, (tuning curves) intensity coding, spontaneous activity, action potentials, Volley theory, pathology
Readings: Musiek & Baran, ch. 7; Gelfand, ch. 5; Moller, pp. 155-157, 171-173. Handouts.

**9/29-10/1**
Auditory nerve con’t & animations

**10/6-8**
Brainstem pathway; anatomy; acoustic/startle reflexes, tonotopic aspects, frequency/intensity coding, ABR, binaural processes, vascular anatomy
Readings: Musiek & Baran, ch. 1; pp 17-24(CANS)

**10/13-15**
Brainstem con’t

**10/20-22**
Auditory cortex and sub cortex, anatomy, tonotopic aspects, coding intensity, EPs. Vascular anatomy
Readings: Musiek, Baran, ch. 12

**10/27-29**
* Brain dissection (tentative) or 3-D brain print models
11/3-5  Interhemispheric and efferent function. Anatomy, transcallosal activity, neurological aspects,  
Readings: Musiek & Baran, ch. 13.
11/10-12  Pathoanatomy, pathophysiology of the CANS (Readings to be announced)
11/17-19  Efferent system  
Readings: ch. 15.
11/24-26  OCB, neurotransmitters , No Class, Thanksgiving (26th)
12/1-3  Neuroradiology (optional), catch up
12/8  Catch up and Review

Faculty:
Dr.Frank Musiek, Dr. Renata Filippini

Principles to guide you in reading neurobiology of the auditory system.

- The more rostral you proceed up the auditory system the more humans and animals are dissimilar.
- There are many errors in publication on anatomy and physiology (A & P) of the auditory system. Be careful of publications that are not peer reviewed and internet information that is not med line. If you are unsure ask the instructor.
- There has been a virtual explosion of information on A & P of the auditory system in the past decade. This is great but much is not relevant to audiology, lets work on mostly information that is pertinent.
- Auditory neurobiology, functional anatomy, biology, neuroscience, physiology, neuropathology, physiological acoustics, for purposes of this course are all synonyms for structure and function.
- Anatomy physiology and psychoacoustics are tightly linked, one tells us about the other. Both in normal and disordered states.
- Knowledge about A & P of the auditory system is knowledge about hearing.
- It has been well shown that individuals well grounded in A & P make the best clinical audiologists (especially in diagnostics).
- Diagnostic audiology has and will continue to be anatomically based, i.e., conductive, sensorineural, cochlear, retrocochlear, peripheral, central, etc.
- The auditory system works sequentially and in parallel. This facilitates quick processing.
- The auditory system is highly temporal, speed is critical. In the auditory system it is the “Quick and the dead” – it operates quickly or it doesn’t operate.
- The peripheral auditory system is practically mature at birth but the central auditory system matures in the teenage years.

Topics for Presentation : the “classics”
1. Neff, Butler & Diamond – Discrimination findings related to Ablations of Auditory Cortex in Cat.
2. Bekesy’s experiments leading up to the Nobel Prize.
3. Penfield’s experiments on auditory cortex stimulation during neurosurgery.
4. Dublin’s work on the pathology of kernicterus (hyperbilirubinemia).
5. Galambos’s experiments on the OCB.
6. Brownell’s Hair cell motility studies.
7. Morest’s transsynaptic degeneration & related issues.
8. Carhart’s tone decay test and related studies on adaptation.
9. Moller’s recordings of the ABR waves during neurosurgery.
10. Schuknecht’s cochleogram and damage from high intensity noise exposure.
11. The Heffners’ early work on primate brain ablations and hearing.
12. Dewson’s experiments on OCB and noise.
13. Woolsey’s research on auditory cortex.
14. Raichle’s studies on auditory cortex and fMRI or PET.
15. Zwislocki’s studies on “fundamentals” of the cochlea.
16. Tonndorf’s studies on cochlear function and cochlear disorders.
17. W. House, electrical stimulation of the auditory nerve & early cochlear implants.
18. Pandya’s work on inter-hemispheric connections.
19. J.Vernon & others, mechanisms of tinnitus.
20. Nelson Kiang: studies of the physiology of the auditory nerve

Term paper presentation will require a 12 minute lecture on the topic selected. At the time of the presentation you will need to hand in a concise 2 page summary and key references of the main points of your presentation. You should include at least 1 illustration or figure. Your grade will be solely dependent on your presentation unless the summary is very poorly done or not turned in—then points will be subtracted from your presentation.