580.626 Structure and Function of the Auditory and Vestibular Brain, Fall 2014

Brain mechanisms and perception of sound and balance. This course is an accompaniment for 580.625, although the courses can be taken in either order. Topics include representation of sound and balance in neural discharge patterns, anatomy of the central auditory and vestibular systems, synaptic transmission and signal processing in central neurons, and complex sound perception and movement control. Aspects such as speech perception, sound localization, vestibular reflexes and vestibular compensation are discussed with an integrated perspective covering perceptual, physiological, and mechanistic data.

Prerequisites: General introduction to neuroscience, such as 580.422, 440.811-12, 80.305-306 or equivalent.

Xiaojin Wang and Eric Young 3 hours T, Th 9:00-10:30, 529 Ross at the SOM
Offered fall even-number years

FIRST MEETING THURSDAY, AUGUST 28, 2014 IN 529 ROSS BLDG. SCHOOL OF MEDICINE

The course will consist of two lectures per week, on Tuesday and Thursday 9:00-10:30 in Ross 529 at the School of Medicine. Each week a short writing assignment will be due. That paper will answer a question posed in the lectures for that week that will require looking up one or two papers from the literature. There will be no additional assignments or exams.
Structure and Function of the Auditory and Vestibular Brain. 580.626, Fall 2014.

Meets T, Th 9-10:30 in 529 Ross at the SOM. Contact ED Young (eyoung@jhu.edu) or X Wang (xiaojin.wang@jhu.edu).

8/28 Introduction, organization. Overview of labyrinthian transduction – endorgan structure, hair cells, auditory tuning, vestibular sensitivity. (Young)

9/2, 4 Auditory stimulus encoding – tuning, representation of simple and complex stimuli, nonlinearity, reverse correlation. Representation of information in spike trains. (Young)

9/9 Speech production, the speech signal. Envelope and fine structure. What the brain must decode. (Young)

9/11, 16 Anatomical organization of the auditory brainstem. Cochlear nucleus cell types, synaptic organization, response properties, biophysical properties. (May)

9/18 Internal organization of the inferior colliculus, inputs, stimulus representation. (May)

9/23 Anatomy lab. (May)

9/25 Auditory efferents, cortex to cochlea. (May)

9/30, 10/2 Basic psychophysics with clinical implications. Masking and auditory filters, pitch, loudness, and detection theory. (Lauer)

10/7, 9 Sound localization, psychophysics and physiology. (Young)

10/14, 21 Overview of vestibular function: transduction and endorgan specificity, neural representation of orientation and movement, eye movements and the VOR, posture. (Della Santina, Carey).

10/23 Modeling vestibular and VOR function. (Della Santina)

10/28, 30 What does the brain do with the vestibular information? (du Lac)

11/4 Clinical aspects of vestibular and oculomotor physiology (Zee)

11/6 Anatomical organization of thalamus and cortex (Hendry)

11/11 Physiology of the auditory thalamus (Wang)

11/13 Functional organization of auditory cortex and tonotopic maps (Wang)

11/18 Neural coding in auditory cortex: spectral and temporal processing (Wang)

11/20 Neural coding in auditory cortex: spatial and binaural processing (Wang)

12/2 Auditory-vocal interactions and auditory feedback processing (Wang)

12/4 Perception of complex sounds (Wang)