SDSU Systems Neuroscience

Professor:
Marty Sereno -- email: msereno@sdsu.edu
class time (2018): MWF 9:00-9:50 AM (grad: F 8:00-8:50 AM)
location: SSW 2667
expect to take copious notes
exam mostly based on lecture content

Readings:
readings, lecture videos (links, top of homepage)
background reading (neuroscience reference texts):
background reading (undergrad neuroscience textbooks):

Exams:
multiple question short-answer, each question with a few subsections, examples given in lecture
undergraduate: 2 midterms, final -- short-answer (midterms: 30% each, final: 40%)
graduate: 2 midterms, final (midterms: 24% each, final: 32%), and short final paper (20%)
old pdf answer keys from my similar UCSD Systems Neuroscience course (2007) here and here

Learning Objectives:
Students will be able to do the following:
(1) describe and explain neuronal chemistry, electronics, development, and evolution
(2) describe and diagram neuroanatomical structures and their connections in visual, somatosensory, auditory, motor, limbic systems
(3) describe and analyze sequential processing stages in visual, somatosensory, auditory, motor, limbic systems from a signals and systems perspective
N.B.: consult with me if a disability hinders your performance so we can use University resources to maximize learning

Lecture Topics: (Spring 2018)

Week of Feb 19 (MWF) -- Visual System II
general scheme for cortical layers
details, brightness, and primary motion in V1
1st midterm review
1st Midterm Exam -- Fri, Feb 23

Week of Feb 26 (MWF) -- Visual System III
aperture problems in general (color intro)
aperture problems for vis. pattern translation, optical flow
visual attention
visual object recognition

Week of Mar 05 (MWF) -- Somatosensory System
somatosensory receptor types
arm diagram (length, force, alpha/gamma motoneurons)
pathways (dorsal column, spinthalamic, spinocerebellar)
somatosensory cortical areas
somatosensory cortical plasticity

Week of Mar 12 (MWF) -- Auditory System I
auditory transduction and hair cell receptors
monaural cochlear nuclei responses

Week of Mar 19 (MWF) -- Auditory System II
auditory brainstem sound localization
ecolocation and speech sound processing
auditory cortical areas

Week of Mar 26 -- SPRING BREAK

Week of Apr 02 (MWF) -- Motor System I
gaze stabilization (VOR, OKN, pursuit)
superior colliculus retinal and motor maps
sensorimotor coord transforms (double-step memory saccade)
multisensory map interactions -- sup. collic visual/auditory
multisensory map interactions -- VIP somatosensory/visual

Week of Apr 09 (MWF) -- Motor System II
motor system overview
cortical and spinal pattern generators
motor cortex
2nd midterm review
2nd Midterm Exam -- Fri, Apr 13

Week of Apr 16 (MWF) -- Motor System III
cerebellum anatomy, physiology
cerebellum and learning/connectional overview
cerebellum/functional overview striatum
striatum and hierarchical sequencing

Week of Apr 23 (MWF) -- Limbic System
connectional overview limbic system
H.M. and intermediate term memory vs. inertial guidance
place cells
head direction cells
grid cells
models: theta rhythms, attractor networks

Week of Apr 30 (MW) -- Neuroimaging EEG/MEG
hardware, spin vs. precession, Bloch equation
spin echo and gradient echo
phase-sensitive detection, intro to complex numbers,
frequency-encoding -- incorrect and correct intuitions
signal-to-noise
neural source of EEG/MEG signals
current source density, linear forward solution
course review

May 07 -- Final Exam 8-10 AM
Graduate students: final paper due May 10