**BISC 421 Fall 2020**

**Title:** Neurobiology

**When and Where:**

Lectures: MWF, 11:00 - 11:50, anywhere and everywhere

**Discussion Leaders**

Aida Bareghamyan

[baregham@usc.edu](mailto:baregham@usc.edu)

13399R 12:00-1:50pm Friday

13400R 12:00-1:50pm Wednesday

Ahyun Jung

[ahyunjun@usc.edu](mailto:ahyunjun@usc.edu)

13402R 8:00-9:50am Thursday

13395R 2:00-3:50pm Thursday

Colton Smith

[coltonsm@usc.edu](mailto:coltonsm@usc.edu)

13396R 2:00-3:50pm Friday

13398R 2:00-3:50pm Wednesday

Chao Wei

[wei428@usc.edu](mailto:wei428@usc.edu)

13397R 2:00-3:50pm Monday

13401R 2:00-3:50pm Tuesday

**Instructors:**

**David McKemy, PhD Judith Hirsch, PhD** **Emily Liman, PhD**

Professor Professor Professor

Neurobiology Section Neurobiology Section Neurobiology Section

Biological Sciences Biological Sciences Biological Sciences

HNB 201 HNB 503 HNB 301

mckemy@usc.edu [jhirsch@usc.edu](mailto:jhirsch@usc.edu) [liman@usc.edu](mailto:liman@usc.edu)

**Office Hours:**

David McKemy: by appointment

Judith Hirsch: by appointment

Emily Liman: by appointment

**Purpose:** According to the Merriam-Webster Dictionary, neuroscience is defined as a branch of the life sciences that deals with the anatomy, physiology, biochemistry, or molecular biology of nerves and nervous tissue and especially with their relation to behavior and learning. This course is designed to assist you in understanding how individual nerve cells process and transmit information, how these neurons organize to form the functional circuits that make up your sensory and motor systems, and how the structure and function of the nervous system are shaped by genetic factors that define how you perceive and respond to the world around you.

**Grading:** The course is divided into three modules with an Exam given after each module, each worth 100 points (including the final). The averages among tests may vary and will be scaled appropriately. Class grades are determined by rank; no one person will alter “the curve.” Any concern about tests scores should be directed to the professor responsible for that test. The full grade for the Discussion Section is 50 points and is based on a brief oral presentation, quizzes, and participation; more detailed information will be provided at the first discussion group meeting. There are no make-up quizzes.

**No make-up exams will be given.** Students who are unable to take an exam at the scheduled time must talk with the Professor giving the exam as soon as possible. Note that the bar for being excused from an exam is extremely high. Students who have missed an exam for medical reasons must provide the Professor with proof of illness shortly afterward. If the student has a valid, documented reason for missing the exam, as judged by the Professor giving the exam, the average score on the remaining exams will be weighted to compensate for the missed test. There are no make-up exams.

**Course Material:** Course materials (syllabus, readings, lecture figures, etc.) will be available on Blackboard. <https://blackboard.usc.edu>. Develop the habit of checking Blackboard. Many important announcements will appear first on Blackboard.

**Text:** Neuroscience, 5th or6th Edition. Purves et al., editors. Sinauer Associates, Sunderland MA, 2008 or 2012 and ISBN# 0878936971 or 9780878936953, respectively. Students may use an earlier version of the text, but must be aware that the instructors often use the later version for lectures and exams.

**Students with Disabilities:** Students requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP when adequate documentation is filed. Please be sure the letter is delivered to one of the instructors as early in the semester as possible. The link for Disability Services and Programs is <https://dsp.usc.edu/> and their phone number is (213) 740-0776.

**Statement on Academic Integrity:** USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, <https://policy.usc.edu/student/scampus/> contains the Student Conduct Code in Section 11.00, along with the process for sanctions. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: <https://sjacs.usc.edu/>

**USC Technology Support Links**

[Zoom information for students](https://keepteaching.usc.edu/start-learning/)

[Blackboard help for students](https://studentblackboardhelp.usc.edu/)

[Software available to USC Campus](https://software.usc.edu/)

**Class Schedule**

**Topic Lecturer**  **6th ed. 5th ed.**

**Module I:**

Week 1:

08.17 Cell Biology of the Neuron McKemy Ch 1, 1-12 Ch 1, 1-14

08.19 Experimental Methods in Neuroscience McKemy Ch 1, 12-29 Ch 1, 18-20,26-29,36,42

08.21 The Membrane Potential McKemy Ch 2 Ch 2

Week 2:

08.24 The Action Potential McKemy Ch 3 Ch 3

08.26 Ion Channels McKemy Ch 4, 65-74 Ch4, 57-69

08.28 Structure and Diseases of Ion Channels McKemy Ch 4, 75-83 Ch 4, 70-75

Week 3:

08.31 Synaptic Transmission I McKemy Ch 5 Ch 5

09.02 Synaptic Transmission II McKemy Ch 5 Ch 5

09.04 Neurotransmitter Receptors,

Synthesis and Reuptake Liman Ch 6 Ch 6

Week 4:

09.07 Labor Day

09.09 Intracellular Signal Transduction Liman Ch 6 Ch 6

09.11 Synaptic plasticity I McKemy Ch 8 Ch 8

Week 5:

09.14 Synaptic plasticity 2 McKemy Ch 8 Ch 8

***End of Material for Module I***

**Module II:**

09.16 Organization of the Nervous System Hirsch Ch 1 Ch 1

09.18 **Exam on Module I** **McKemy**

Week 6:

09.21 Motor: Spinal Cord, Brainstem and CortexHirsch Ch 16, Ch 17Ch 16, Ch 17

09.23 Motor: Basal Ganglia Hirsch Ch 18 Ch 18

09.25Motor: Cerebellum Hirsch Ch 19 Ch 19

Week 7:

09.28 Motor: Eye Movements Hirsch Ch 20 Ch 20

09.30 Visceral Motor Systems Hirsch Ch 21 Ch 21

10.02 Vision I:The Eye and Photoreception Hirsch Ch 11, 233-251 Ch11249-49

Week 8:

10.05 Vision II: Early Visual Pathway Hirsch Ch 11, 251-259 Ch 11, 249-256

10.07 Vision III: Higher Cortical Processing Hirsch Ch 12 Ch 12

10.09 Peripheral Auditory System Hirsch Ch 13, 281-296 Ch 13 279-293

Week 9:

10.12 Central Auditory System Hirsch Ch 13, 297-304 Ch 13 293-302

10.14 Vestibular System Hirsch Ch 14 Ch 14

10.16 Experience-Dependent Plasticity Hirsch Ch 24 Ch 24

***End of Material for Module II***

**Module III**

Week 10:

10.19 Pain McKemy Ch 9 Ch 9

10.21 **Exam on Module II Hirsch**

10.23 Somatosensation Liman Ch10

Week 11:

10.26 Olfactory system Liman Ch 15, p323-342 Ch 15, p321-34

10.28 Innate Behaviors and Pheromones Liman Ch 15, p343-345 Ch 15, p328-329

10.30 Taste system Liman Ch 15, p345-353 Ch 15, p341-349

Week 12:

11.02 Circadian Rhythms and Sleep I Liman Ch 28, 643-660 Ch 28

11.05 Circadian Rhythms and Sleep II Liman Ch 28, 643-660 Ch 28

11.07 Construction of Neural Circuits I Liman Ch 23 Ch 23

Week 13:

11.09 Construction of Neural Circuits II Liman Ch 23 Ch 23

11.11 Lateralization, Language and Emotion Liman Ch 27, 31,33 Ch 27, 29

11.13 Attention and Memory Liman Ch 29, 30 Ch 26, 31

***End of Material for Module III***

**Finals Week:**

**Exam on Module III**

11.18 11 AM-12:00 PM (60 minutes) **Liman**