

**BIOLOGY 450
NEUROBIOLOGY
Fall Semester, 2019**

Course summary: Neurobiology is a vast, rapidly-changing field of life science that focuses on the brains and nervous systems of diverse animals. This course will provide an overview of principles, concepts, and current research in neurobiology and related fields. Lectures will encompass topics such as cellular neurophysiology, neuroethology (the neurobiology of animal behavior), behavioral and sensory physiology, development of the nervous system and learning and memory. The class includes both textbook readings and analysis of primary research papers. It is intended for upper-level undergraduates (juniors and seniors) and beginning graduate students who wish to acquire a foundational knowledge of contemporary neurobiology.

Instructor (first half of course): Dr. Ken Lohmann
KLohmann@email.unc.edu

Instructor (second half of course): Dr. Toshi Hige
Hige@email.unc.edu

Lectures: 10:10 a.m. to 11:00 a.m. on Monday, Wednesday, and Friday in room 128 of Wilson Hall. This course has no lab.

Textbook: Neuroscience: Exploring the Brain by Bear et al. (4th edition). Supplementary readings on specific topics will also be assigned; these will be available as PDFs on Sakai.

Office Hours:

First Half of Class: During the first half of the class, Dr. Lohmann's office hours will be on Wednesday from 11:15 to 12:15 in Coker 403. In addition to the scheduled office hour, Dr. Lohmann will be available to answer questions for a short time immediately after each lecture. Appointments can also be scheduled at other times.

Second Half of Class: During the second half of the class, Dr. Hige's office hours will be on Wednesday from 11:15 to 12:15 in Genome Sciences Building 3157. Dr. Hige will also usually be available to answer questions for a short time immediately after each lecture.

E-mail contact: You are free to send e-mail to your instructors, but please be aware that professors often receive as many as two hundred e-mail messages a day and cannot always respond promptly (or at all). A face-to-face conversation remains the most reliable and effective mode of communication and should be used whenever possible. You will have four chances most weeks -- three lectures plus office hours.

Grading: Grading will be based on the following:

Hourly exams 1, 2, and 3 (first two exams are 100 points each; third is 80)....	280
Two 5-point, open-book, online quizzes during first month of class.....	10
Attendance and participation (during second half of class)	20
Worksheets on primary literatures (during second half of class)	20
Final Exam	90
Total Points	420

Exam and Quiz Dates:

- Online Quiz 1: Wednesday, August 28 (open book, taken online outside of class)
- Online Quiz 2: Monday, September 9 (open book, taken online outside of class)
- Exam 1: Monday, September 16
- Exam 2: Friday, October 11 (cumulative for first half of class)
- Exam 3: Wednesday, November 8
- FINAL EXAM: Friday, December 13 at 8 a.m.

Note: In accordance with UNC policy, the final exam can only be taken at the designated time.

TENTATIVE LECTURE SCHEDULE (expect changes):

First half of the class will be taught by Professor Lohmann

- W 8-21 Introduction to the course; anatomy of neurons
F 8-23 Membrane potentials; resting potential; Nernst equation
- M 8-26 Bio-electricity; Goldman equation; ion pumps
W 8-28 Ion channels; electrical gradients and behavior: paramecium movement
F 8-30 Action potentials, tetrodotoxin, and the strange case of zombies
- M 9-02 No class; Labor Day
W 9-04 Local anesthesia; optogenetics; threshold for spiking; action potential propagation
F 9-06 Electrophysiological methods (intracellular, extracellular recording, EEG, MEG)
- M 9-09 Brain-driven robots/neural interface systems
W 9-11 Electrical and chemical synapses; neurotransmitters; “instant neuropharmacology”
F 9-13 Neuroethology; neural circuitry underlying the escape swim of the sea slug *Tritonia*
- M 9-16 Hourly Exam I**
W 9-18 Ethology & behavioral physiology in neuroscience; detection of ocean waves by sea turtles
F 9-20 Neuroethology of cockroach escape behavior
- M 9-23 Neuro-parasitology and mind control: how parasites control host behavior for their own ends
W 9-25 Auditory system I: anatomy of mammalian ears; tuning curves; auditory threshold functions
F 9-27 Auditory system II
- M 9-30 Auditory system III
W 10-02 Electroreception I: electrocytes; how animals produce and detect electric fields
F 10-04 Electroreception II: active and passive electroreception
- M 10-07 Magnetoreception I: perception of magnetic fields by animals
W 10-09 Magnetoreception II
F 10-11 **Hourly Exam 2 (cumulative exam; covers first half of class)**

Second half of class will be taught by Professor Hige

- M 10-14 Vision: phototransduction I
W 10-16 Vision: phototransduction II
F 10-18 No class; Fall Break
- M 10-21 Evolution of visual system
W 10-23 Higher-order processing of vision
F 10-25 Developmental plasticity of visual circuit
- M 10-28 Primary literature reading (Vision)
W 10-30 Primary literature reading (Vision)
F 11-01 Primary literature reading (Vision)
- M 11-04 Primary literature reading (Vision)
W 11-06 Primary literature reading (Vision)
F 11-08 Hourly Exam 3
- M 11-11 Mammalian olfactory system
W 11-13 Invertebrate olfactory system
F 11-15 Learning and memory: synaptic plasticity

M 11-18 Learning and memory: invertebrate models
W 11-20 Primary literature reading (Learning and memory)
F 11-22 Primary literature reading (Learning and memory)

M 11-25 Primary literature reading (Learning and memory)
W 11-27 No class; Thanksgiving
F 11-29 No class; Thanksgiving

M 12-02 Primary literature reading (Learning and memory)
W 12-04 Primary literature reading (Learning and memory)

F 12-13 Final Exam at 8 a.m. (exam covers all of the second half of the class)

Honor Code: Observance of the UNC Honor Code is expected. For more information on the honor code and honor system at UNC please visit <https://studentconduct.unc.edu>.

Accommodations: If you need an accommodation for a physical or learning disability, please contact Accessibility Resources and Services (ARS website: <https://accessibility.unc.edu>; phone: 919-962-8300; email: accessibility@unc.edu). Please also notify your instructors by e-mail or in person so that we can help ensure that suitable arrangements are made to meet your needs.