

Integrative Neuroscience

MCB 462 / NEURO 462

Spring 2018

Organization: Lecture: 2:00-2:50 MWF, 1000 Lincoln Hall = 3 hr/week
Discussion section: 1:00-1:50 Fri, Location TBD = 1 hr/week currently
elective for no credit

Online Discussion Forums/ Quizzes: 1/week

Assessment: 2 Hourly Exams + 1 Comprehensive Final

Text: Fundamental Neuroscience, 4th edition (Squire, Roberts, *et al.*)

Instructors: Rhanor Gillette (Burrill 414; OH: Tues 2-4;
<rhanor@life.illinois.edu>) and Martha Gillette (Morrill 618; OH: Tues 2-4;
<mgillett@illinois.edu>)

TA/Course Administrators: Raj Iyer (Morrill 617) and Ekaterina Gribkova
(Burrill 422)

Office Hours: Time and location TBD; <iyer5@illinois.edu>;
<gribkov2@illinois.edu>

I-Clickers: Please arrange to use one for responding to in-class questions

Moodle Course Website: Will be up on learn.illinois.edu (log-in using your NetID)

****Please take a moment to watch this brief safety video –**
<http://police.illinois.edu/emergency-preparedness/run-hide-fight/>

Course Summary: Integrative Neuroscience applies multi-level systems approaches to nervous system structure and function, and how its cells and circuits generate behavior. Topics include an overview of brains, how they evolved and are organized, new vistas in neural modeling, new technologies in discovering brain function, the brain's cellular substrates, biological substrates of thought and emotion, patterned neuronal activity and movement, sensory systems, integration

of sensation, cellular and systems natures of pain, biological rhythms and sleep, learning and memory, behavioral decision-making, neuroeconomics, motivation and reward, human learning, and the roots of conscience and consciousness. Prerequisite: MCB 252 or instructor consent.

Grading: Breakdown of Course Material for Determining Overall Grade

20%	Exam 1
20%	Exam 2
35%	Final Exam (Cumulative)
7%	(6) Discussion Forum Exercises
15%	(10) Online Quizzes
3%	<i>Quick Responses</i> by I-Clicker during class to address major points of previous lecture = complete 75% to be awarded points
(+5%)	Extra-Credit Wiki Project
5 pts added to the final total for completing ICES Evaluation	

Assessment

Our goal here is to determine how to make this course fulfill your goals and to develop it into a model for other similar courses. We offer a Discussion Section to a self-selected group of students to assess the value-added of additional discussion and experience with neuroscience concepts. At this time, we cannot offer credit for the discussion section. However, it is a special opportunity to enhance your understanding, especially if you have little experience with the type of material we cover. In order to achieve a meaningful analysis, those who enroll are required to attend. Please consider whether you would like to participate and sign up on the Pre-Survey, by Jan. 22.

Exams

- Two hourly exams and a comprehensive final will be administered during the semester.
- Exams will consist of multiple-choice questions, and free-response questions, which will be confirmed a week before each test.

- A list of possible examination questions will be made available approximately one week before each exam.
- Multiple choice and any free-response questions in the exams will be derived from topics closely related to these questions.
- The comprehensive final exam will be weighted toward the material in the last 3rd of the lectures. The final exam will be held during the Final Exam period; the date and location will be set by MCB Curriculum Office.
- Students **anticipating an absence** on any exam dates **must** contact the TAs **at least a week in advance**.

Discussion Forum Exercises

Neuroscience is a subject that profoundly affects our everyday lives and permeates nearly every facet of our society. Students will respond to six controversial or thought-provoking questions throughout the semester, citing peer-reviewed literature in some instances to support their arguments. After initial postings have been made, students then reply to at least two of their classmates' posts. Full credit for each exercise is awarded depending on to full participation (*i.e.*, initial responses and peer replies must be thoughtful and conform to specific exercise instructions).

Online Quizzes

Ten untimed online quizzes will be given throughout the semester. They will primarily feature multiple-choice questions, with an occasional question requiring a short reply or numerical answer. Questions will reflect both lecture and reading material. Quizzes are to be submitted by the deadline via the Moodle course website.

Extra-Credit Wiki Project

An optional project will be available to students interested in a 5% bonus for their final grades. Students select an integrative neuroscience topic **not explicitly covered** in the course, and after receiving approval from the TA or instructors, make a short Wiki page devoted to an overview of their topic (minimum 1,500 words, first in Word and then on the Moodle website) . This

overview must cite at least ten peer-reviewed sources from the scientific literature. Full credit is awarded for full participation and may involve revisions of the Wiki page. Further instructions will be made available on the course website after Spring Break.

Website Content

Lecture Power Points/pdfs, exam questions, readings, online quizzes, relevant links, and multimedia material are easily available through the Moodle course website. A chat room and discussion/exam forums are set up on our Moodle site to facilitate free exchange of information and formation of study groups among students, with TA and instructor participation. Regular announcements will be posted on the website and e-mailed to all enrolled students.

Late Policy

Late submissions of an online quiz or discussion forum exercise during the semester will be penalized. Students should notify the TA of emergencies or extenuating circumstances **before** assignment deadlines. Exceptions and point deductions are made on a case-by-case basis at the discretion of the TAs.

Final Grades

Final alphanumeric grades are determined based on the aggregate points available for activities listed under Grading and at the discretion of the instructors and TAs.

Lecture Schedule:

- Jan. 17. Introduction to the course and its assessment. **Pre-Survey Assessment 1** administered. Safety information reviewed.
Overview of Brains. Basic concepts in behavior and conceptual modeling with neuronal constructs **M, R, R.I., K.G.**
- Jan. 19. Behavior: Patterning and interlocking contingencies **R**
- Jan. 22. Behavioral economics **R**

- Jan. 24. The evolution of nervous systems and behavior **R**
- Jan. 26. Substrates of thought: cellular resting potentials **R**
- Jan. 29. Substrates of thought: action potentials **R**
- Jan. 31. Cellular substrates of brain function -1 **M**
- Feb. 2. Cellular substrates of brain function -2 **M**
- Feb. 5. Enabling technologies for studying the brain function **M**
- Feb. 7. Substrates of thought: synaptic transmission **R**
- Feb. 9. Neuromodulation: Substrates of arousal and emotion **R**
- Feb. 12. Emergence of patterned neuronal activity **R**
- Feb. 14. Central pattern generators **R**
- Feb. 16. Pattern generators, rhythmic behaviors, and neuromodulation **R**
- Feb. 19. **EXAM 1**
- Feb. 21. Building nervous systems: Homeostatic Plasticity **R**
- Feb. 23. Evolution of the mammalian brain, **Assessment 2 R**
- Feb. 26. Fundamentals of sensory systems **M**
- Feb. 28. Vision 1 **M**
- Mar. 2. Vision 2 / Chemical senses **M**
- Mar. 5. Chemical senses 2 **M**
- Mar. 7. Audition **M**
- Mar. 9. Kinesthesia and Proprioception **M**
- Mar. 12. Pain **M**
- Mar. 14. Stress **M**
- Mar. 16. The clocks that time us **M**
- Spring Break (No classes March 17-25)*
- Mar. 26. How do you build a biological clock? **M**

- Mar. 28. Biological rhythms and social behavior **M**
- Mar. 30. **Exam 2**
- Apr. 2. Integrating mechanisms of biological clocks **M**
- Apr. 4. Regulatory systems: the hypothalamus; Respiration and cardiovascular functions **M**
- Apr. 6. Sleep-1 **M**
- Apr. 9. Sleep-2 **M**
- Apr. 11. Lateral and recurrent inhibition: pattern analysis, templating, integration and attentional mechanisms **R**
- Apr. 13. Learning rules at cell and circuit **R**
- Apr. 16. Simple interactions of neuronal circuits and behavioral choice, Neuroeconomics of decision **R**
- Apr. 18. Neuronal circuits, nutrient stores, behavioral arousal, reproduction, and choice **R**
- Apr. 20. Affiliative behavior and parenting **M**
- Apr. 23. Motivation and reward **R**
- Apr. 25. Human learning – **Guest lecturer Neal Cohen**
- Apr. 27. Valuation, reward, and risk assessment in the nervous **R**
- Apr. 30. Roots of conscience and consciousness in the brain **R**
- May 2. Open Review, **Assessment 3**, ICES Final
- May TBD Final Exam**