

**BIO334**  
**PRINCIPLES OF NEUROBIOLOGY**

Course Syllabus – Spring 2017

The class meets on Tu/Th from 8:30-9:50 a.m. in Frey Hall, Room 102

**Instructors:** Dr. Craig Evinger (Course Director) and Dr. Qiaojie Xiong, Department of Neurobiology & Behavior

**TA:** Adrian DiAntonio

**UTAs:** Kacper Iwanowski, Eric Mensah, Rhea Persaud, Lyle Suh

**Course Philosophy:** Neuroscience explores the brain functions using approaches ranging from molecular to behavioral investigations. No matter what type of scientific research you find interesting, neuroscientists are using it to investigate the brain. BIO334 is an introduction to the diversity of neuroscience research. The course begins with a review of cellular and molecular mechanisms of brain function, considers brain systems for motor control and sensory processing, and then finishes with a discussion of the cellular and molecular underpinnings of higher brain functions such as learning, emotion, and cognition.

Jan 23	(Tues)	1. Introduction/Brain Organization	(Evinger)
Jan 25	(Thurs)	2. Nervous System Structure	(Evinger)
Jan 30	(Tues)	3. Autonomic and Enteric Nervous System	(Evinger)
Feb 1	(Thurs)	4. Neural Development	(Evinger)
Feb 6	(Tues)	5. Electrical Signaling	(Xiong)
Feb 8	(Thurs)	6. Synaptic Transmission	(Xiong)
Feb 13	(Tues)	7. Neurotransmitter Systems	(Xiong)
Feb 15	(Thurs)	<b>Exam I (Lectures 1-7)</b>	(Evinger)
Feb 20	(Tues)	8. Introduction to Movement	(Evinger)
Feb 22	(Thurs)	9. Motor Units / Reflex Circuits	(Evinger)
Feb 27	(Tues)	10. Higher Order Motor Control I	(Evinger)
Mar 1	(Thurs)	11. Higher Order Motor Control II	(Evinger)
Mar 6	(Tues)	12. Introduction to Sensation	(Evinger)
Mar 8	(Thurs)	13. Somatic Sensation	(Evinger)
Mar 13	(Tues)	<b>SPRING BREAK</b>	
Mar 15	(Thurs)	<b>SPRING BREAK</b>	
Mar 20	(Tues)	14. Chemical Senses	(Xiong)
Mar 22	(Thurs)	<b>Exam II (Lectures 8-14)</b>	
Mar 27	(Tues)	15. Vision: Retina	(Evinger)
Mar 29	(Thurs)	16. Vision: Cortex	(Evinger)
Apr 3	(Tues)	17. Audition	(Evinger)
Apr 5	(Thurs)	18. Vestibular / VOR	(Evinger)
Apr 10	(Tues)	19. Oculomotor	(Evinger)
Apr 12	(Thurs)	<b>Exam III (Lectures 15-19)</b>	
Apr 17	(Tues)	20. Learning and Memory	(Xiong)

Apr 19 (Thurs)	21. Reward and Addiction	(Xiong)
Apr 24 (Tues)	22. Language and Attention	(Evinger)
Apr 26 (Thurs)	23. Brain Mechanisms of Emotion and Sex	(Xiong)
May 1 (Tues)	24. Neural Basis of Mental Illness	(Xiong)
May 3 (Thurs)	25. Memory and Cognition	(Xiong)

**May 8 (Tuesday) 11:15 am – 1:45 pm Exam IV (Lectures 20-25)** (held in regular class room: Frey Hall 102)

### **Course Objectives**

Upon completion of this course, students will achieve a broad understanding of the fundamental principles that govern the structure, development, and function of the human brain. These principles will equip students for further understanding of nervous system function, either formally through additional coursework or informally through lifelong, self-directed study. The course will provide tools that students can use to understand how behavior (including their own) is shaped at all levels by brain function. At the end of the course, students will:

1. understand the anatomical and cellular organization of the adult brain, how it reaches that state during development, and how brains arose during evolution. (lectures 1-4)
2. be able to explain how electrical and chemical signals are generated and transmitted by brain neurons. (lectures 5-7)
3. know how transmission of information among brain neurons is modified on the basis of experience and relate those changes to learning and memory. (lecture 20)
4. understand how specific brain and spinal cord systems are organized to control motor behavior and how motor system dysfunction arises in diseases like Parkinson's disease and Huntington's disease. (lectures 8-11)
5. understand how sensory systems, including somatic senses, chemical senses, vision, audition, and vestibular senses, are organized to extract information about the environment. (lectures 12-18)
6. be able to describe how sensory and motor information are integrated by the brain (lecture 19)
7. become familiar with brain regions involved in emotion, cognitive function, and language, and describe how physical damage or neurochemical defects can lead to disorders of cognition and to mental illness. (lectures 20-25)
8. be able to comprehend and evaluate new information about brain function and brain disorders as it becomes available and apply that understanding to their own personal experiences.

**Office hours:**

**Dr. Craig Evinger:** Life Sciences Room 521  
Tu: 2:00-3:30 pm Wed: 3:00-4:30 pm  
Other times by appointment  
e-mail: [leslie.evinger@stonybrook.edu](mailto:leslie.evinger@stonybrook.edu)

**Dr. Qiaojie Xiong:** Life Sciences Room 540  
Tu: 2:00-3:30 pm Thurs: 2:00-3:30 pm  
Other times by appointment  
e-mail: [qiaojie.xiong@stonybrook.edu](mailto:qiaojie.xiong@stonybrook.edu)

**TA, Adrian Di Antonio:** Life Sciences Room 564  
Tu: 10 -11:30 am, Thu: 10 -11:30 am  
Other times by appointment  
e-mail: [BIO334TA@gmail.com](mailto:BIO334TA@gmail.com)

**UTAs:** For all UTAs: Life Sciences Room 056  
**Kacper Iwanowski**, Wed 1-2:00 pm  
Other times by appointment  
e-mail: [kacper.iwanowski@stonybrook.edu](mailto:kacper.iwanowski@stonybrook.edu)

**Eric Mensah**, Wed 11 am-12 pm  
Other times by appointment  
email: [eric.mensah@stonybrook.edu](mailto:eric.mensah@stonybrook.edu)

**Rhea Persaud**, Mon 2:30-3:30 pm  
Other times by appointment  
email: [rhea.persaud@stonybrook.edu](mailto:rhea.persaud@stonybrook.edu)

**Lyle Suh**, Thurs 3:00-4:00 pm  
Other times by appointment  
email: [lyle.suh@stonybrook.edu](mailto:lyle.suh@stonybrook.edu)

Information and updates about the class and supplemental class materials will be on Blackboard ([blackboard.stonybrook.edu](http://blackboard.stonybrook.edu)). We will also post links to informative and interesting web sites dealing with Neuroscience on the class Blackboard site. As we cover new materials, this list will be updated. The instructors will try to put files containing lecture slides on Blackboard at least one day before each lecture. Note that the purpose of providing these lecture materials is to make it easier for students to follow along with the lecture, without having to devote attention to drawing diagrams and graphs. The purpose is NOT to replace the lecture itself.

There is no required or recommended textbook for the course. Nevertheless, numerous introductory texts for neuroscience are available, although no one of them covers all the material in this course at the level of detail we present. Students wishing to supplement the course work with additional readings could consider the following books (in increasing level of difficulty): *Cellular Physiology of Nerve and Muscle*,

Matthews; *Neuroscience: Exploring the Brain*, 3<sup>rd</sup> Edition, Bear et al.; *From Neuron to Brain*, 5<sup>th</sup> Edition, Nicholls et al.; *Principles of Neural Science*, 5<sup>th</sup> Edition, Kandel et al. There is also a link to an open-access online textbook of neuroscience in the documents section of Blackboard.

There is a discussion board on Blackboard, "Ask the Professor". Anyone who has a question about a lecture or material covered in a lecture can post it. We encourage anyone to submit an answer to the question. Professor Evinger will monitor the board and provide guidance to the answers.

All lectures will be recorded in full using Echo and made available through Blackboard. **We emphasize that we cannot guarantee that each lecture will be recorded successfully. There can be technical problems with such recordings and/or web access to them. Based on experience, technical problems are likely to occur. Technical failures of the Echo system or problems with web access will not be considered a valid excuse for lack of student preparation for exams, or for poor exam performance. Therefore, students should not count on the recorded lecture as a replacement for the live version.** The instructors have no control over Blackboard or Echo recordings. Any problems with access to Blackboard or to Echo recordings must be reported directly to Teaching, Learning, and Technology (631-632-9602; 631-632-9800; [tlt@stonybrook.edu](mailto:tlt@stonybrook.edu); [helpme@stonybrook.edu](mailto:helpme@stonybrook.edu); [it.stonybrook.edu/help/kb/where-to-get-help](http://it.stonybrook.edu/help/kb/where-to-get-help)).

#### **Grading:**

The four exams will consist of multiple choice questions, drawn exclusively from the material covered in lectures. For your final grade, your three highest scores each count 30% and the lowest score counts 10%.

Final letter grades will be assigned based on the overall score calculated as described above and rounded to the nearest whole percent, **using the following absolute scale:** A:  $\geq 90\%$ ; A-: 88-89%; B+: 86-87%; B: 81-85%; B-: 78-80%; C+: 75-77%; C: 50-74%; D: 42-49%; F:  $< 42\%$ . This scale assumes a median overall score of 75%, which is based on past performance. If the actual overall median score for this year is less than 75%, an appropriate scaling factor will be applied to all scores to bring the median up to 75% (that is, scores will be increased), and then the scale above will be applied. If the actual overall median score is greater than 75%, no correction will be applied (that is, scores will never be reduced), and the scale above will be applied to the unadjusted scores. Since the grade cut-offs are clear at the outset, you can judge where you stand in the course as the semester proceeds. **Note:** although some of the score ranges may seem small (especially those for + or - grades), these ranges contain quite a few students, given the size of the class. **No appeals of final letter grades or requests for additional work to improve your grade will be considered.**

#### **Attendance at exams:**

Any person arriving late to an exam will not be able to take the exam if one of the other students taking the exam has already finished and left the exam room. As some students finish the exams quickly, you should arrive on time for the start of the exams.

#### **Problems with exam questions:**

After the exam, you will be able to take the exam with you and the answers will be posted on Blackboard. Dissatisfaction with any exam question may be submitted in writing via e-mail to Dr. Evinger ([leslie.evinger@stonybrook.edu](mailto:leslie.evinger@stonybrook.edu)) within 24 hours after the answers are posted. No appeals will be accepted after this 24-hour period. This is your opportunity to indicate questions that you think are ambiguous or unfair. Credit will be given for acceptable answers if your criticisms are justified in the judgment of the faculty.

**Missed Exams:**

In case of illness, you may be excused from an exam provided you contact Dr. Evinger (632-8728; leslie.evinger@stonybrook.edu) within 24 hours of the exam **and** you submit a doctor's note within one week of the exam. A makeup exam for the missed exam will be given after last midterm exam during the final exam period.

**DISABILITY SUPPORT SERVICES (DSS) STATEMENT**

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC(Educational Communications Center) Building, Room 128, (631)632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>.

**ACADEMIC INTEGRITY STATEMENT**

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at: [http://www.stonybrook.edu/commcms/academic\\_integrity/index.html](http://www.stonybrook.edu/commcms/academic_integrity/index.html)

**CRITICAL INCIDENT MANAGEMENT**

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.