

Syllabus
FUNDAMENTALS OF NEUROBIOLOGY 146:245
 Spring 2022
 Rutgers University
 Department of Cell Biology and Neuroscience

Instructors: David Margolis, PhD david.margolis@rutgers.edu (course director)
 Victoria Abraira, PhD victoria.abraira@dls.rutgers.edu
 Rafiq Huda, PhD rafiq.huda@rutgers.edu

Textbook: Neuroscience, 6th Edition, Purves, et al., Sinauer Associates, Oxford University Press, ISBN-13: 978-1605353807

Course Description

This course will serve as the basis for fundamental understanding of brain function in health and disease.

Enduring Understanding 1: Neurons are electrical cells and communicate through synaptic transmission	
Essential Question 1A: How do neurons generate electrical signals and communicate with each other?	
Goal 1	Understand how ion movement acts to generate action potentials.
Goal 2	Understand how voltage-gated ion channels contribute to the electrical activity of neurons.
Essential Question 1B: What are the cellular mechanisms of synaptic transmission and neural plasticity?	
Goal 1	Understand what synaptic transmission is and how it is regulated.
Goal 2	Understand the molecular mechanisms of intracellular signaling and synaptic plasticity in neurons.
Enduring Understanding 2: Sensory signals are transmitted from peripheral sensory receptors to the central nervous system.	
Essential Question 2A: What is the neural basis of the sense of touch, hearing, and the chemical senses?	
Goal 1	Understand the neural systems of touch, proprioception, and pain.
Goal 2	Understand the neural systems of hearing, and the chemical senses (taste and smell).
Essential Question 2B: What is the neural basis of vision and movement?	
Goal 1	Understand the neural systems of vision.

Goal 2	Understand the neural systems of motor control, and the visceral motor system.
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Enduring Understanding 3: The brain possesses elaborate mechanisms underlying development, and “higher brain functions” such as learning, attention, sleep, emotional processing, and decision-making.	
Essential Question 3A: How does the brain develop and undergo plasticity?	
Goal 1	Understand early brain and neural circuit development.
Goal 2	Understand experience-dependent plasticity.
Essential Question 3B: How does the brain carry out higher cognitive processes?	
Goal 1	Understand the neural mechanisms of cognitive processing and attention, sleep and wakefulness.
Goal 2	Understand the neural mechanisms of emotional processing, planning and decision-making.

CBN Learning Goals

- 1. Master factual and conceptual knowledge in cell biology and neuroscience that will provide a solid foundation for success in advanced training and professional careers.**
 - We will cover a broad range of material in this course, including the foundational cell types, tissues, and molecular pathways that are central to brain function.
 - Lecture modules and quizzes will be organized in ways that illuminate the common themes and concepts that underlie the complexities of the nervous system. These organizing concepts include cellular and molecular signaling, neural systems, and cognitive processes.
- 2. Develop an ability to summarize, integrate and organize information.**
 - Quizzes, review sessions, and other exercises will focus on the application of learning towards problem solving, identifying patterns in complex information, and designing experiments capable of creating new knowledge.
- 3. Use scientific reasoning to evaluate the potential for current research and new discoveries to improve our understanding of cell biology and neuroscience and its relevance to human health and to our society.**
 - Course material will make frequent reference to the experiments and techniques used by scientists working at the forefront of neurobiology research, including electrophysiology, molecular biology, imaging, optogenetics, behavioral paradigms, etc.
 - Often, we will explore how the foundational knowledge covered in the course helps researchers and clinicians understand neurological and neuropsychiatric disorders and their potential treatments.

Assessments and Course Activities

Lecture Modules (in-person): All content delivery in this course will be through synchronous **in-person** lectures during the assigned period 4 (Tues./Thurs. 2:00 - 3:30 pm) in classroom SEC 209 on Busch campus. Students are expected to attend all lectures, although attendance will not be taken.

Quizzes: There will be weekly quizzes, which will be taken through the Canvas site (online). The quizzes will be available to take on Canvas usually starting on a **Friday** and must be completed by **the following Wednesday**. The TA will review the quiz material during the Wednesday office hours. Thus, quizzes cannot be made up after the due date.

Synchronous Virtual Review Sessions and Office Hours (via Zoom): There will be one synchronous review session per week led by the TA, and also one synchronous office hours run by the professor for the current module. These will be chances for you to ask questions, review material, and generally check in with the instructors and your classmates. The TA will review the quiz material, as stated above. Review sessions and office hours will be recorded and posted to Canvas so that they can be viewed by students who are unable to attend. Day and time of these sessions to be determined at the start of the semester.

Exams: There will be three **in-person** exams (in the classroom). Exams will usually be multiple choice questions that require critical thinking in order to select the most appropriate answer. Exams will be held in the classroom. Notes or outside resources will not be allowed. **Exams must be taken on the indicated day in the course schedule during the regularly scheduled class period.** You should plan your schedule on these days accordingly. Exams will not be rescheduled or made up except in the event of a serious, prolonged, and documented illness or family emergency.

Grading: Final course grades will be assigned according to the total points accumulated from scores on the assignments indicated below. Your final grade in the course will be determined by the weighted average of your scores using the following distribution. It is unlikely that final course grades will be "curved" in any way, but this is up to the discretion of the professors.

Assignment Value	
Quizzes	25%
Exam 1	25%
Exam 2	25%
Exam 3	25%

A	90.0-100.0
B+	87.0-89.9
B	80.0-86.9

**Final Grade Final
Average**

C+	77.0-79.9
C	70.0-76.9
D	60.0-69.9
F	0.0-59.9

Course Schedule

Date	Time	Location	Synchronous Lectures (in-person) <i>Times for weekly TA/Prof review sessions T.B.D.</i>	
1/18	2:00-3:20 pm	SEC 209	Studying the Nervous System (Chapter 1)	Margolis
1/20	2:00-3:20 pm	SEC 209	Electrical Signals of Nerve Cells (Chapter 2)	
1/25	2:00-3:20 pm	SEC 209	Voltage-Dependent Membrane Permeability (Chapter 3)	
1/27	2:00-3:20 pm	SEC 209	Ion Channels and Transporters (Chapter 4)	
2/1	2:00-3:20 pm	SEC 209	Synaptic Transmission (Chapter 5)	
2/3	2:00-3:20 pm	SEC 209	Neurotransmitters and Their Receptors (Chapter 6)	
2/8	2:00-3:20 pm	SEC 209	Molecular Signaling within Neurons (Chapter 7)	
2/10	2:00-3:20 pm	SEC 209	Synaptic Plasticity (Chapter 8)	
2/15	2:00-3:20 pm	SEC 209	Review or T.B.D.	
2/17	2:00-3:20 pm	SEC 209	Block I EXAM	
2/22	2:00-3:20 pm	SEC 209	Touch and Proprioception (Chapter 9)	Abraira
2/24	2:00-3:20pm	SEC 209	Pain (Chapter 10)	
3/1	2:00-3:20 pm	SEC 209	Hearing and Balance (Chapter 13,14)	
3/3	2:00-3:20pm	SEC 209	Chemical Senses (Chapter 15)	
3/8	2:00-3:20 pm	SEC 209	Vision (Chapter 11,12)	
3/10	2:00-3:20pm	SEC 209	Motor Neurons (Chapter 16,17)	
3/22	2:00-3:20 pm	SEC 209	Visceral Motor System (Chapter 21)	
3/24	2:00-3:20pm	SEC 209	Review or T.B.D.	
3/29	2:00-3:20 pm	SEC 209	Block II EXAM	
3/31	2:00-3:20 pm	SEC 209	Neural Circuit Development (Chapter 23)	Huda
4/5	2:00-3:20 pm	SEC 209	Experience dependent plasticity (Chapter 25)	
4/7	2:00-3:20 pm	SEC 209	Cognition (Chapter 27)	
4/12	2:00-3:20 pm	SEC 209	Attention (Chapter 29)	
4/14	2:00-3:20 pm	SEC 209	Sleep and Wakefulness (Chapter 28)	

4/19	2:00-3:20 pm	SEC 209	Emotion (Chapter 31)	
4/21	2:00-3:20 pm	SEC 209	Thinking, planning, and deciding (Chapter 32)	
4/26	2:00-3:20 pm	SEC 209	Review or T.B.D.	
4/28	2:00-3:20 pm	SEC 209	Review or T.B.D.	
5/5	2:00-3:20 pm	SEC 209	Block III EXAM	

Course Policies and Resources

Academic Integrity Policy:

<http://academicintegrity.rutgers.edu/academic-integrity-policy>

Violations include: cheating, fabrication, plagiarism, denying others access to information or material, and facilitating violations of academic integrity.

Student-Wellness Services:

Just In Case Web App

<http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884

17 Senior Street, New Brunswick, NJ 08901

www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Crisis Intervention:

<http://health.rutgers.edu/medical-counseling-services/counseling/crisis-intervention>

Report a Concern: <http://health.rutgers.edu/do-something-to-help>

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181

3 Bartlett Street, New Brunswick, NJ 08901

www.vpva.rutgers.edu

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800

Lucy Stone Hall, Suite A145, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555

<http://www.scarletlisteners.com>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.