

**Syllabus**  
**FUNDAMENTALS OF NEUROBIOLOGY 146:245**  
 Spring 2021  
 Rutgers University  
 Department of Cell Biology and Neuroscience

**Instructors:** David Margolis, PhD [david.margolis@rutgers.edu](mailto:david.margolis@rutgers.edu) (course director)  
 Victoria Abaira, PhD [victoria.abaira@dls.rutgers.edu](mailto:victoria.abaira@dls.rutgers.edu)  
 Rafiq Huda, PhD [rafiq.huda@rutgers.edu](mailto:rafiq.huda@rutgers.edu)

**Textbook:** Neuroscience, 6<sup>th</sup> Edition, Purves, et al., Sinauer Associates, Oxford University Press

**Course Description**

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

<b>Enduring Understanding 1:</b> Neurons are electrical cells and communicate through synaptic transmission	
<b>Essential Question 1A:</b> 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.
<b>Essential Question 1B:</b> 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.
<b>Enduring Understanding 2:</b> Sensory signals are transmitted from peripheral sensory receptors to the central nervous system.	
<b>Essential Question 2A:</b> 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).
<b>Essential Question 2B:</b> 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.

**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:** All content delivery in this course will be through asynchronous lecture videos posted on the Canvas site. Each weekly module will include a number of lecture videos covering the topic shown in the syllabus. You are expected to watch each video before the end of each week.

**Quizzes:** There will be weekly quizzes, which will be taken through the Canvas site. 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 Review Sessions (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.

**Exams:** There will be three online exams on Canvas. Exams will be multiple choice questions that require some level of critical thinking in order to select the most appropriate answer. Exams will be open book/note/resource; however, exams will be timed, so you should not plan to overly rely on finding answers in external sources, as you will likely not complete the exam on time. **Exams must be taken on the indicated day in the course schedule between 12:00PM and 11:59PM.** You should plan your schedule on these days to reserve approximately 90 minutes to take the exam. **Exams will not be rescheduled or re-opened once started.** Individual exceptions will only be made in the event of a serious, prolonged, and documented illness or family emergency.

We will take certain measures to ensure the integrity of the exam process and minimize cheating. This will include strict time limits on exams, randomized question and answer orders, and a one-at-a-time question format. You will not be able to move backwards in the exam to a previous question once you submit an answer. Thus, you should carefully select your answer before moving to the next question. We will NOT be using any remote proctoring software or lockdown browsers in this course.

**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	Final Grade	Final Average
Quizzes	25%	A	90.0-100.0
Exam 1	25%	B+	87.0-89.9
Exam 2	25%	B	80.0-86.9
Exam 3	25%	C+	77.0-79.9
		C	70.0-76.9
		D	60.0-69.9
		F	0.0-59.9

## Course Schedule

<b>Date</b>	<b>Time</b>	<b>Synchronous Recitation/ Office Hours</b>	<b>Asynchronous Lecture Materials</b>	
			Introduction to Block I	
1/20	12:00-1:20pm	TA recitation (Ch. 1,2)	Studying the Nervous System (Chapter 1)	Margolis
1/22	1:40-3:00 pm	Prof. office hours (Ch. 1,2)	Electrical Signals of Nerve Cells (Chapter 2)	
1/27	12:00-1:20pm	TA recitation (Ch. 3,4)	Voltage-Dependent Membrane Permeability (Chapter 3)	
1/29	1:40-3:00 pm	Prof. office hours (Ch. 3,4)	Ion Channels and Transporters (Chapter 4)	
2/3	12:00-1:20pm	TA recitation (Ch. 5,6)	Synaptic Transmission (Chapter 5)	
2/5	1:40-3:00pm	Prof. office hours (Ch. 5,6)	Neurotransmitters and Their Receptors (Chapter 6)	
2/10	12:00-1:20pm	TA recitation (Ch. 7,8)	Molecular Signaling within Neurons (Chapter 7)	
2/12	1:40-3:00pm	Prof. office hours (Ch. 7,8)	Synaptic Plasticity (Chapter 8)	
2/17	12:00-1:20pm	TA recitation (Review)	Q&A exam prep	
2/19	24 hours	Block I EXAM	Introduction to Block II	
2/24	12:00-1:20pm	TA recitation (Ch. 9,10)	Touch and Proprioception (Chapter 9)	Abraira
2/26	2:00-3:20pm	Prof. office hours (Ch. 9,10)	Pain (Chapter 10)	
3/3	12:00-1:20pm	TA recitation (Ch.13-15)	Hearing and Balance (Chapter 13,14)	
3/8	2:00-3:20pms	Prof. office hours (Ch.13-15)	Chemical Senses (Chapter 15)	
3/10	12:00-1:20pm	TA recitation (Ch.11,12)	Vision (Chapter 11,12)	
3/22	2:00-3:20pm	Prof. office hours (Ch.11,12)	Motor Neurons (Chapter 16,17)	
3/24	12:00-1:20pm	TA recitation (Ch.16,17,21)	Visceral Motor System (Chapter 21)	
3/29	2:00-3:20pm	Prof. office hours (Exam prep)		
3/31	24 hours	Block II EXAM	Introduction to Block III	
4/7	12:00-1:20pm	TA recitation (Ch. 22, 23)	Early Brain Development (Chapter 22)	Huda
4/9	1:40-3:00 pm	Prof. office hours (Ch. 22, 23)	Neural Circuit Development (Chapter 23)	
4/14	12:00-1:20pm	TA recitation (Ch. 25, 27, 29)	Experience dependent plasticity (Chapter 25)	
4/16	1:40-3:00 pm	Prof. office hours (Ch. 25, 27, 29)	Cognition and Attention (Chapter 27,29)	
4/21	12:00-1:20pm	TA recitation (Ch. 28, 31)	Sleep and Wakefulness (Chapter 28)	
4/23	1:40-3:00 pm	Prof. office hours (Ch. 28, 31)	Emotion (Chapter 31)	
4/28	12:00-1:20pm	TA recitation (Ch. 31, 32)	Thinking, planning, and deciding (Chapter 32)	
4/30	1:40-3:00 pm	Prof. office hours (Exam prep)		
5/5	12:00-1:20pm	TA recitation (Review)		
5/6	24 hours	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/](http://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](http://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.