01:146:245 FUNDAMENTALS OF NEUROBIOLOGY

This course is intended for students who plan to major in CBN. Other students with a strong background in the Biological Sciences may register for this course but are advised to take Essentials of Cell Biology & Neuroscience (01:146:295) instead.
This course may be used to fulfill the elective requirements of the Biological Sciences major.

Exam 1: October 10, Monday 12:10 - 1:30 pm
Exam 2: November 10, Thursday 12:10 - 1:30 pm
Exam 3: Date/Time during Finals Week TBA

Offered
Fall

Credits
3

Prerequisites
General Biology 119:115-116 or 119:101 -102
Knowledge of the basic principles of chemistry and physics is important to success in this course. This 200 level course is aimed at sophomores and juniors who plan on majoring in Cell Biology and Neuroscience. However, students who take this as their first biology course at Rutgers often struggle. This includes many transfer students plus some freshmen and sophomores with AP credit for General Biology.

Faculty
Dr. Robin L. Davis (Coordinator)
D417 Nelson Labs
Busch Campus
email: rldavis@rci.rutgers.edu

Dr. Shu Chan Hsu
D419 Nelson Labs
Busch Campus
Hsu@biology.rutgers.edu

TA
To Be Named

Course Description
This course is an intensive and demanding survey of neurobiology. It is the prerequisite for upper level undergraduate courses in neurobiology and is required for students majoring in Cell Biology & Neuroscience.

The primary focus is on the mammalian nervous system. After an introduction to nerve cells and anatomy, the first module will cover electrical and chemical signaling in the nervous system.

Success in this part of the course requires the ability to master principles of physics and chemistry that apply to the molecular basis of signal generation within and between nerve cells. The second module of the course covers the topic of neural systems, placing the greatest emphasis on sensory processing. Principles ranging from the molecular events underlying transduction to the neural pathways that process complex information will be covered for hearing, vision, touch, pain, smell, taste and motor control.

The third module includes lectures on developmental neurobiology and higher cognitive processes such as language, emotions and learning. In the end, the focus shifts to behavioral aspects of neuroscience but the emphasis is still on biological mechanisms that are involved in cognition.

Course URL

The course makes use of Canvas, which is a password protected site that is used to post lecture notes, grades, and supplementary information.

Course 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.

-Know key concepts underlying neural functions.
-Know the molecular and cellular components of the nervous systems.
-Know major landmark processes underlying neuronal development from zygote to brain.

2. Develop an ability to summarize, integrate and organize information.

-Understand how regulation of neurotransmission contribute to neural plasticity.
-Understand how components of the nervous systems integrate to mediate motor activities and sensation perception.
-Understand how coordination of molecular and cellular processes mediate the construction, maintenance and function of the nervous systems.

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.

-Able to predict neuronal activities based on changes in neuronal properties.
-Able to identify neurocircuits that give rise to motor and sensory behaviors and dysfunctions.
-Able to diagnose how changes in molecular and cellular regulations can affect the nervous system development and functions.

Course format: Classes will meet at Hill Center, Busch Campus, Room 114 on Mondays and Thursdays from 12:10 to 1:30pm. Supplemental lecture videos will be made available online through Canvas and the schedule of optional TA-led weekly recitation sessions will be announced on the first day of class. Students can schedule office hours with faculty instructors and the TA as needed.

Date	Monday	Thursday	Chapter	Lecture Topic	
9/8		12:10 - 1:30pm	1	Studying the Nervous System	Davis
9/12	12:10 - 1:30 pm		2	Electrical Signals of Nerve Cells	
9/15		12:10 - 1:30pm	3	Voltage-Dependent Membrane Permeability	
9/19	12:10 - 1:30pm		4	Ion Channels and Transporters	
9/22		12:10 - 1:30pm	5	Synaptic Transmission	
9/26	12:10 - 1:30pm		6	Neurotransmitters and Their Receptors	
9/29		12:10 - 1:30pm	7	Molecular Signaling within Neurons	
10/3	12:10 - 1:30pm		8	Synaptic Plasticity	
10/6		12:10 - 1:30pm		Optional Review Session	
10/10	12:10 - 1:30pm			Unit I EXAM	
10/13		12:10 - 1:30pm	9	The Somatic Sensory System: Touch and Proprioception	Davis
10/17	12:10 - 1:30pm		10	The Somatic Sensory System: Pain	
10/20		12:10 - 1:30pm	11	Vision: The Eye	
10/24	12:10 - 1:30pm		12	Vision: Central Pathways	
10/27		12:10 - 1:30pm	13	The Auditory System	
10/31	12:10 - 1:30pm		16, 17	Lower and Upper Motor Neuron Control	
11/3		12:10 - 1:30pm	18, 19	Modulation of Movement	
11/7	12:10 - 1:30pm			Optional Review Session	
11/10		12:10 - 1:30pm		Units II and III EXAM	
11/14	12:10 - 1:30pm		22	Early Brain Development I (Module 3; Unit IV))	Hsu
11/17		12:10 - 1:30pm	22	Early Brain Development II	
11/21	12:10 - 1:30pm		23	Construction of Neural Circuits	
11/22		Tuesday 12:10 - 1:30pm (Thursday Class)	24	Modification of Neural Circuits as a Result of Experience	
11/24		No class		Thanksgiving	
11/28	12:10 - 1:30pm		25	Repair and Regeneration in the Nervous System	
12/1		12:10 - 1:30pm	26, 27	Cognition and Language	
12/5	12:10 - 1:30pm		28	Sleep and Wakefulness	
12/8		12:10 - 1:30pm	29	Emotions, Addiction an Depression	
12/12	12:10 - 1:30 pm			Optional Review Session	
TBA				UNIT IV EXAM	

Exams, Assignments, and Grading Policy

A) 90% of the final grade will be based upon the average of the three non-cumulative module examinations. Should the class exam average fall below 75% a curve will be applied to raise the final grades.

B) 10% of your grade is based upon completing and submitting your answers to scheduled quizzes. This is a great practice for taking the exams because you can test your knowledge in advance.

C) There will be three multiple choice exams:

1) neural signaling 2) sensory and motor systems and 3) the changing brain.
The first two exams are given as scheduled, the last exam will be given during final exam week. The three exams are not cumulative and are weighed equally for the final grade.

No extra credit will be given.

Make-up exam policy: make-up exams will only be given for serious illness with documentation from doctor or hospital.

Course technical requirements:
A laptop with internet access for accessing course materials.

Technology challenges:
Please visit the Rutgers Student Tech Guide page for resources available to all students. If you do not have the appropriate technology for financial reasons, please email Dean of Students deanofstudents@echo.rutgers.edu or complete the contact form for assistance. If you are facing other financial hardships, please visit the Office of Financial Aid at https://financialaid.rutgers.edu/.

Course Materials
Required Text: Neuroscience 6th edition 2018 by Purves *et al*, published by Sinauer Press ISBN: 978-0-87893-695-3

Course Closed?
If this course is closed, please use the following link to add your name to the wait list: Wait List Sign Up for Fall 2020 Courses . If you have any questions, please contact the Division of Life Science - Office of Undergraduate Instruction at 848-445-2075 or visit our office at Nelson Labs B112, Busch Campus.

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.

** All information is subject to change at the discretion of the course coordinator.