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Fall 2023

BIOL 315-003: Principles of Neurobiology

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BIOL 315-003: Principles of Neurobiology

COURSE SCHEDULE:	**Mon, Weds 11:30 am – 12:50 pm**
	NJIT Central King Building (CKB) 114
INSTRUCTOR:	**Dr. Kristen Severi (severi@njit.edu)**
OFFICE HOURS:	**TBD, also by appointment (Zoom)**
COURSE WEBSITE:	**NJIT Canvas (https://canvas.njit.edu/)**

COURSE SUMMARY

This introductory-level course will review the basic principles of how the nervous system is organized, and how neurons, synapses and neuronal circuits function in order to produce behavior. We will work our way from the molecular level all the way to discussing circuits, systems, and behavior, including development, sleep, memory, as well as a brief look at neurological disorders, and the effect of climate change on the nervous system and behavior.

TEXTBOOK

"Principles of Neurobiology" by Liqun Luo (2016) (first edition), from Garland Science, ISBN 978-0-8153-4492-6. The book is available at the NJIT bookstore. We will rely on the textbook heavily and you are expected to complete the assigned reading BEFORE class. Additional learning materials will be posted on Canvas.

LEARNING GOALS

At the end of the course students will be able...

- To understand and utilize basic concepts in cellular neuroscience.
- To be able to explain how electrical currents across neuronal membranes are generated.
- To be able to describe how neurons and the nervous system are built, and the relationship between structure and function of the nervous system.
- To be able to describe how a neuron interacts with others to communicate in neuronal networks.
- To be able to explain how sensory and motor systems function.
- To be able explain the basic elements that enable functional and morphological plasticity of the nervous system.
- To understand and be able to explain how basic rhythmic activity is generated and it's functional role.
- To understand the relationship between nervous system function and climate, and how that may be changing.
- To develop critical thinking skills.

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COURSE OUTLINE (This outline may change due to course pacing)

Week / Date		Topic	Book Chapter
Week 1	9/6	Course Introduction • Principles of signaling and organization of the nervous system • Methods	Chapter 1
Week 2	9/11 9/13	The Membrane • General electrical properties of excitable cells *[Sept 11: Last day to Add/Drop a class]*	Chapters 1 & 2
Week 3 Quiz 1 (9/18)	9/18 9/20	Electrical properties of cells • Resting potential • Passive properties • Neuronal electrophysiology • I-V graph	Chapters 1 & 2
Week 4 Quiz 2 (9/25)	9/25 9/27	Ionic channels: gating and ion currents • Action potential generation, propagation.	Chapter 2
Week 5 Quiz 3 (10/2)	10/2 **10/4**	Ionic channels, gating and ion currents (cont) **MIDTERM 1 (Oct 4)**	Chapter 2
Week 6	10/9 10/11	Neuronal communication: Chemical synaptic transmission • Role of Calcium • Quantal release •	Chapter 3
Week 7 Quiz 4 (10/16)	10/16 10/18	Neurotransmitters & modulators • Receptors • Ionotropic, metabotropic actions • Post-synaptic responses	Chapter 3
Week 8 Quiz 5 (10/23)	10/23 **10/25**	Metabotropic transmission • short term synaptic plasticity **MIDTERM 2 (Oct 25)**	Chapter 3
Week 9	10/30 11/1	Sensory systems (Vision)	Chapters 4/6
Week 10 Quiz 6 (11/6)	11/6, 11/8	Sensory Systems (Audition)	Chapter 4/6, Chapter 7
Week 11 Quiz 7 (11/13)	11/13 11/15	Motor systems and regulation *[Nov 13 is last day to withdraw]*	Chapter 8
Week 12	**11/20** 11/22	**MIDTERM 3 (Nov 20)** Friday class schedule, Thanksgiving – No class	Chapter 8
Week 13	11/27 11/29	Circadian activity and Sleep	Chapter 8
Week 14 Quiz 8 (12/4)	12/4 12/6	Learning and Memory	Chapter 10
Week 15 Quiz 9 (12/11)	12/11 12/13	Nervous system disorders Neurobiology and Climate Change	Chapter 11
MIDTERM 4 during final exam period, not cumulative – TBA			

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GRADING POLICY AND SCALE

Assignment	%
Weekly Quizzes (10, but worst quiz will be dropped from grade)	35
Midterm Exams (non-cumulative, 16.25% x 4)	65
TOTAL	**100**

Weekly quizzes are aimed at reinforcing learning of the material. Quizzes will be given online on Canvas ONLY. The format will be 4 to 5 questions on the material covered in the previous week. The quizzes will be timed (15 minutes) with one question available at a time (no going back).

Midterm exams will be in person in the same classroom as the lectures.

Grading Scale	
A	90.0 - 100
B+	84.0 – 89.9
B	76.0– 83.9
C+	69.1 – 75.9
C	62.0 - 69.0
D	55.1 – 61.9
F	0 – 55.

IMPORTANT RULES AND POLICIES

- If you miss an exam due to a valid excuse, medical or other, you need to provide valid and verifiable documentation to the Dean of Students Office and ask them to inform the instructor. Make-up assignments will be determined on a case-by-case basis.
- There will be no makeup for missed quizzes. If you are late or not present without notifying the instructor **ahead of time** you will get a zero for that quiz.
- The use of cell phones and other two-way electronic devices during exam times is prohibited.

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- Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy. Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office.

  Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office.

- Course Repetition Policy: An NJIT student may take a single course no more than four times (counting NJIT and other institutions), including withdrawals. If an undergraduate course is repeated at NJIT or the course is transferred from another institution, only then the lowest of the grades is excluded in computation of the cumulative GPA. All grades are shown on the student's transcript.

- Final exam conflict resolution rules: http://www.njit.edu/registrar/exams/conflict.php

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NJIT SUPPORT RESOURCES

Emergency Support
Crises Happen: If you experience a life emergency and are unsure which support services to turn to, NJIT Public Safety can connect you to emergency support systems - call 973.596.3111. For medical, psychological or psychiatric emergencies you can also call: University Hospital Crisis, 973.623.2323.

If you want to report a concern about another students' well-being you can also reach out to the **NJIT CARE Team** (https://www.njit.edu/care/) or the Dean of Students Office (973.596.3466).

Mental Health and Stress Management
Center for Counseling and Psychological Services **(C-CAPS)** is committed to advancing the mental health and wellbeing of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available: https://www.njit.edu/counseling/gethelp

Special Accommodations
If you have a disability or a personal circumstance that will affect your learning in this course, please let your instructor know as soon as possible so that we can discuss the best ways to meet your needs. Any student who needs accommodation for disabilities should also contact the **Office of Accessibility Resources and Services (OARS)**: https://www.njit.edu/studentsuccess/accessibility

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