

# Principles of Neurobiology

Spring 2025

**BIOL315-004**

**Tuesdays and Thursdays**

**2:30 - 3:50p**

**CKB room 314**

**Instructor: Gal Haspel [haspel@njit.edu](mailto:haspel@njit.edu)**

**Office hours:** Tuesdays 4:00-5:00p and by email appointment.

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, and 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 (1<sup>st</sup> edition)

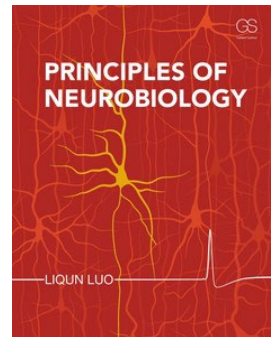
by Liqun Luo

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ISBN-10 0815344929

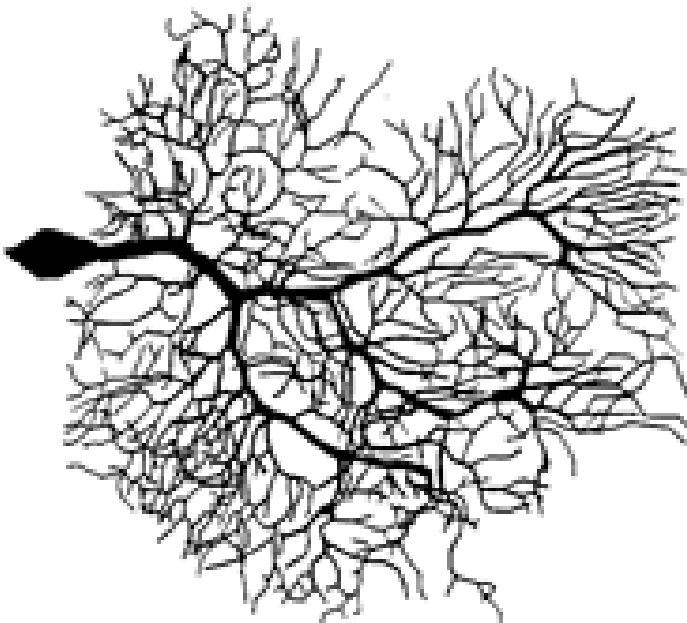
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Publisher: Garland Science



The book is available at the NJIT bookstore.

We will heavily rely on the textbook, and you are expected to complete the assigned reading BEFORE class. Additional learning materials will be posted on Canvas.



## Learning expectations and assessment:

1. Understand and use basic concepts in cellular neuroscience.
2. Explain how electrical currents are generated across neuronal membranes.
3. Describe the structure of neurons and the nervous system and the relationship between structure and function.
4. Describe how a neuron interacts to communicate in neuronal networks.
5. Explain how sensory and motor systems function.
6. Explain the basic elements that enable functional and morphological plasticity of the nervous system.
7. Understand and be able to explain how basic rhythmic activity is generated and its functional role.
8. Develop critical thinking skills.

Students will be asked to participate in discussions of the material as they analyze problems and propose possible mechanisms neurons use. Weekly quizzes will reinforce learning of the material.

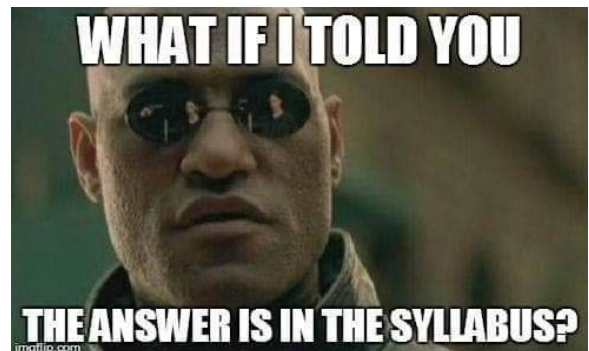
### Grading:

15% Weekly quizzes (worse grade dropped) and Canvas tasks.  
85% Exams (four exams, 21.25% each)

Weekly quizzes aim to reinforce the material's learning and serve as a study guide for students. Quizzes will be given online on Canvas ONLY. They will consist of 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).

Exams will be in person in the same classroom as the lectures.

Grading Scale	
A	90 - 100
B+	85 - 89
B	80 - 84
C+	75 - 79
C	70 - 74
D	60 - 69
F	0 - 59



**Course outline** (specifics may change due to course pacing):

Dates	Topics	Text (Luo)	Notes
T Jan 21 R Jan 23	Course Introduction • Principles of signaling and organization of the nervous system • Methods	Chapter 1	
T Jan 28 R Jan 30	The Scientific Method • Nerve Cells, Anatomy, Cytoarchitecture • The Membrane • General electrical properties of excitable cells	Chapter 2	Prerequisite Quiz
T Feb 4 R Feb 6	Electrical properties of cells • Resting potential • Passive properties • Neuronal electrophysiology • I-V curve	Chapter 2	Quiz 1
T Feb 11 R Feb 13	Ionic channels, gating, and ion currents	Chapter 2	Quiz 2
T Feb 18 R Feb 20	Action potential generation, propagation. <b>Exam 1</b> (Feb 20)	Chapter 2	
T Feb 25 R Feb 27	Neuronal communication: Chemical synaptic transmission • Receptors • Role of Calcium • Quantal neurotransmitter release	Chapter 3	Quiz 3
T Mar 4 R Mar 6	Neurotransmitters & modulators • Receptors • Ionotropic, metabotropic actions • Post-synaptic responses	Chapter 3	Quiz 4
T Mar 11 R Mar 13	Metabotropic transmission • Short-term synaptic plasticity <b>Exam 2</b> (Mar 13)		Quiz 5
<b>Spring Break</b>			
T Mar 25 R Mar 27	Sensory Systems: Vision, Audition	Chapters 4, 6	
T Apr 1 R Apr 3	Sensory Systems: Others NJIT Wellness Day- no classes	Chapter 6	Quiz 6
T Apr 8 R Apr 10	Motor systems • Rhythmic behaviors	Chapter 8	Quiz 7
T Apr 15 R Apr 17	<b>Exam 3</b> (Apr 15)		
T Apr 22 R Apr 24	Circadian activity • sleep	Chapter 8	Quiz 8
T Apr 29 R May 1	Learning and Memory OR Neurobiology and Climate Change	Chapter 10	Quiz 9
T May 6	Nervous system disorders	Chapter 11	Quiz 10
<b>Exam 4</b> (during the final exam period, not cumulative)			

## Class Policies:

**Inclusiveness:** I am committed to empathy, equity, and inclusion across all dimensions of identities, from gender, ethnicity, country of origin, and age to religion. As a first-generation college student and a recently naturalized immigrant, I know the uneven playing field many students, faculty, and staff face. On the other hand, I benefit greatly from collaborations with students, peers, and mentors of diverse backgrounds and identities. NJIT commits to a policy of nondiscrimination based on race, sex, sexual orientation, age, religion, ethnic origin, handicap, or veteran status in its employment policies, educational programs, and activities under university control. <https://www.njit.edu/diversityprograms/university-non-discrimination-policy>



**Cell phones and social media:** Please leave the (in-person or virtual) classroom if you need to make an emergency phone call or update your social media accounts. Cell phone use during quiz or exam times is prohibited and will be considered a violation of academic integrity.

**Makeup Exam Policy:** If a student misses an exam for a legitimate reason, including illness, death in the family, accident, requirement to appear in court, etc., they must notify the Instructor and present proof of missing the exam not to the instructor but instead TO THE DEAN OF STUDENTS OFFICE. There will be no makeup for missed quizzes.

**Final exam conflict resolution:** <http://www.njit.edu/registrar/exams/conflict.php>

**Academic Integrity:** The University Code on Academic Integrity is strictly enforced! *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 to which you are working. 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 that is found at <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>. Rutgers has similar rules (<http://www.ncas.rutgers.edu/oas/ai>).*

*Please note that my professional obligation and responsibility is to report academic misconduct to the Dean of Students Office. **Any student found violating the code by cheating, plagiarizing, or misusing any online software will result in disciplinary action. This may include a failing grade of XF and suspension or dismissal from the university.** If you have questions about the Code of Academic Integrity, please contact the Dean of Students Office at [dos@njit.edu](mailto:dos@njit.edu).*

**No materials, internet access, or generative AI are permitted** during quizzes and exams. All submitted material will be scanned for plagiarism and use of AI by Turnitin and similar software. Please ask me if you are unsure whether your action will violate academic integrity.

**Bonus track:** How to email your professor

<https://medium.com/@portwoodstacer/how-to-email-your-professor-without-being-annoying-af-cf64ae0e4087>

## **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 at 973.623.2323.

If you want to report a concern about another student's well-being, you can also contact 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 well-being of its students. If you or someone you know is feeling overwhelmed, depressed, 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>