

Fall 2020

## **BIOL 315-001: Principle of Neurobiology**

Jorge Golowasch

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## Biology 315: Principles of Neurobiology

**Instructor:** Dr. Jorge Golowasch ([golowasch@njit.edu](mailto:golowasch@njit.edu))

**Office Hours:** T, TH 4:00-5:20pm or by email appointment (all meetings on Webex at <https://njit.webex.com/meet/golowasc>)

**Course Schedule:** Tuesday and Thursday 2:30-3:50pm

Course Website through Canvas (must use NJIT email)

Special Covid-19 pandemic conditions reminders (even if they don't apply to you, please read this):

- Masks must be worn before entry to all Biology department facilities,
- Students who attempt to enter a classroom without wearing a mask will be asked by the instructor to wear a mask prior to entry,
- Students who remove their masks at any time during a class session will be asked by the instructor to resume wearing their masks. Accordingly, no consumption of any food will be allowed in class,
- Students who do not comply with a request by a Biology department instructor to wear a mask in accordance with the University's and State's Policies may be subject to disciplinary actions per the rules, regulations, and policies of NJIT,
- Instructors reserve the right to cancel or terminate any class session for safety reasons, such as students failing to comply with faculty or staff request to wear a mask in accordance with University policy,
- Students are strongly encouraged to identify to their instructor any student or instructor not in compliance.
- Finally, all these measures are to protect each other! They are not there to be invasive, annoying or controlling. These are NOT normal times. Let's not behave as if they were!!!

### Course Description:

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 to discussing circuits, systems, and behavior, including development, sleep, memory, as well as a brief look at neurological disorders.

### Textbook:

"Principles of Neurobiology" by Liqun Luo (2016), 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 for the semester:

- 1) To understand and utilize basic concepts in cellular neuroscience.
- 2) To be able to explain how to generate electrical currents across neuronal membranes.

- 3) To be able to describe how neurons are built, and how the brain's complicated structure is formed.
- 4) To be able to describe how a neuron interacts with others to communicate in neuronal networks.
- 5) To be able to explain how sensory and motor system function.
- 6) To explain the basic elements that enable functional and morphological plasticity of the nervous system.
- 7) To develop critical thinking skills.

Students will be asked to participate in group discussions and instructor-led discussions of the material as they analyze problems and propose possible mechanisms used by neurons to solve them. **Weekly quizzes are primarily aimed at reinforcing the learning of the material.**

**Grading Policy and Scale:**

<b>Class participation</b>	<b>5%</b>
Weekly Quizzes (worst 2 grades dropped)	30%
Midterm Exams (16.25% x4) (worst grade dropped)	65%
Total	100%

The 4<sup>th</sup> Midterm exam will be given during the final exam period.

Grading Scale	
A	90.0 - 100
B+	84.0 - 89.9
B	76.0 - 83.9
C+	70.0 - 75.9
C	62.0 - 69.9
D	55.0 - 61.9
F	< 55

The NJIT [Academic Integrity Code](#) will be strictly enforced!

**The use of cell phones and other two-way electronic devices during exam times is prohibited!**

**Exams will be all on Canvas, asynchronous, and both the entire exam as well as individual questions will be timed. It should not be necessary to say this, but exams are individual activities and I expect you to do them by yourselves. No Chegg, no other collaborations are permitted!!**

**I feel strongly against invasive proctoring tools and will not use them. However, I am highly sensitive to this, and will all be checking on these activities. The only way not to feel tempted is to work. This course is not easy, but it is also not for geniuses only.**

**Schedule and Course Outline** (subject to change due to course pacing)

Week / Date		Topic	Book Chapter
Week 1	9/1, 9/3	Course Introduction • Principles of signaling and organization of the nervous system • Methods	Chapter 1
Week 2	9/10	Nerve Cells, Anatomy, Cytoarchitecture • The Membrane • General electrical properties of excitable cells [Sept 8: Last day to Add/Drop a class]	Chapters 1 & 2
Week 3	9/15, 9/17	Electrical properties of cells • Resting potential • Passive properties • Neuronal electrophysiology • I-V graph • Ionic channels, gating and ion currents	Chapters 1 & 2
Week 4	9/22, 9/24	Ionic channels, gating and ion currents • Action potential generation, propagation.	Chapter 2
Week 5	9/29, 10/1	MIDTERM 1 (Sept 29) Action potential generation, propagation continued	Chapter 3
Week 6	10/6, 10/8	Ionic channels, gating and ion currents • Neuronal communication: Chemical synaptic transmission • Receptors • Role of Calcium in release • Quantal release • Neurotransmitter release	Chapter 3
Week 7	10/13, 10/15	Neurotransmitters & modulators • Receptors • Ionotropic, metabotropic actions • Post-synaptic responses	Chapter 3
Week 8	10/20, 10/22	Metabotropic transmission, Short term synaptic plasticity	Chapter 3
Week 9	10/27, 10/29	MIDTERM 2 (Oct 29) Sensory systems (Vision and Audition)	Selections from Chapters 4-6
Week 10	11/3, 11/5	Sensory Systems Motor system introduction	Chapter 4-6, 8
Week 11	11/10, 11/12	Motor systems and regulation	Chapter 8
Week 12	11/17, 11,19	Rhythmic behaviors	Chapter 8
Week 13	11/24	MIDTERM 3 (Nov 24) - No class on Thanksgiving Thursday!	
Week 14	12/1, 12/4	Circuits and complex behaviors Learning and Memory	Chapter 9 Chapter 10
Week 15	12/8, 12/10	Nervous system disorders Neurobiology and Climate Change	Chapter 11
MIDTERM 4 TBA during final exam period (12/14-20)			

- If you miss an exam due to a valid medical excuse, you need to provide a valid and verifiable documentation. The grade or retake of exams missed for valid reasons will be determined on a case-by-case basis. There will be no makeup for missed quizzes. A quiz missed for a valid reason submitted ahead of time will not count towards the average.
- 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



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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>