

BIOLOGY 315-001: Principles of Neurobiology

INSTRUCTOR: Jorge Golowasch (golowasch@njit.edu)

OFFICE HOURS: T, Th: 1:00 - 2:30 pm – CKB 337B

COURSE SCHEDULE: T, Th: 2:30 – 3:55 pm in CKB 310 **COURSE WEBSITE:** <http://moodle.njit.edu/> (Use NJIT email)

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 up to discuss behavior and systems-level issues (development of the nervous system, memory, sensory mechanisms, etc.).

TEXTBOOK:

“Principles of Neurobiology” by Liqun Luo (2016), from Garland Science, ISBN 978-0-8153-4492-6. Be sure to have access to Moodle (<http://moodle.njit.edu/>, login with your NJIT UCID; and use NJIT email).

LEARNING GOALS. AT THE END OF THE COURSE STUDENTS WILL BE ABLE TO...

- 1) Understand and utilize basic concepts in cellular neuroscience,
- 2) Relate how biological molecules work with how electrical currents are generated in neurons,
- 3) Explain how a neuron generates electrical activity in molecular terms,
- 4) Describe and explain how a neuron interacts with others to communicate in functional neuronal networks,
- 5) Explain how sensory and motor system function. Explain the basic elements in development and plasticity of the nervous system.
- 6) Develop basic critical thinking skills. This will be measured in the ability to interpret graphs, to design an experiment, and to discuss a problem.

Students will be required 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 will be used to test some of these goals and reinforce the learning of the material.

GRADING POLICY & SCALE:

Assignment	Percentage
Weekly Quizzes	30%
Midterm Exams	35%
Final Exam (Cumulative)	35%
TOTAL	100%

Grading Scale	
A	88.1 - 100
B+	80.1 - 88
B	73.1 - 80
C+	66.1 - 73
C	60.1 - 66
D	50.1 - 60
F	0 - 50

IMPORTANT RULES AND POLICIES

- ⊗ [Academic Integrity Code](#) is strictly enforced.
- ⊗ The use of cell phones and other two-way electronic devices during class or exam times is prohibited.
- ⊗ If you miss an exam due to a valid medical excuse, you need to provide a doctor’s note or other valid and verifiable documentation. The grade of exams missed for a valid reason will be determined on a case-by-case basis.

- ⊗ **Course Repetition Policy:** An NJIT student may take a single course no more than four times (counting NJIT and another 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>

SCHEDULE AND COURSE OUTLINE: Dates listed by week; class will meet twice every week, unless otherwise noted.

WEEK / DATES		LECTURE TOPICS	BOOK CHAP
Week 1	9/1 & 9/3	Entrance quiz • Introduction • Principles of signaling and organization of the nervous system • Putting together a network that can produce a behavior • Maps • Methods	Chap 1
Week 2	9/10 (Tue is Mon)	Review entrance quiz • Nerve Cells, Anatomy, Cytoarchitecture • The Membrane • General electrical properties of excitable cells <i>[Sept 8: Last day to Add/Drop a class]</i>	Chap 1, 2
Week 3	9/15 & 9/17	Glial cells • Techniques • Intracellular transport • Ion transport • Electrical properties of cells • Resting potential • Passive properties • Neuronal electrophysiology • Interpretation of an I-V graph • Ionic channels, gating and ion currents	Chap 1, 2
Week 4	9/22 & 9/24	Ionic channels, gating and ion currents • Action potential generation, propagation.	Chap 2
Week 5	9/29 & 10/1	MIDTERM 1 (Sept 24) Neuronal communication: Chemical synaptic transmission • Receptors	Chap 3
Week 6	10/6 & 10/8	Ca ⁺⁺ hypothesis Transmitter synthesis • Quantal release • Neurotransmitter release • Indirect transmission	Chap 3
Week 7	10/13 & 10/15	Neurotransmitters and modulators • Receptors • Ionotropic, metabotropic actions • Post-synaptic responses	Chap 3
Week 8	10/20 & 10/22	Short term plasticity MIDTERM 2 (Oct 22)	Chap 3
Week 9	10/27 & 10/29	Visual system as a model of sensory systems and integration	Chap 4
Week 10	11/3 & 11/5	Wiring (development) of the nervous system	Chap 5, 7
Week 11	11/10 & 11/12	Motor systems and regulatory systems	Chap 8
Week 12	11/17 & 11/19	Motor systems and regulatory systems MIDTERM 3 (Nov 19)	Chap 8
Week 13	11/24 Thanks Giving	Memory and learning	Chap 10
Week 14	12/1 & 3	Circuits and complex behaviors	Chap 9
Week 15	12/8 & 10	Brain disorders	Chap 11
FINAL EXAM WEEK: DEC 15 – 21 (FINAL EXAM DATE TBA)			