NJIT BIOLOGY

Course Syllabus

SPRING 2015

BIOLOGY 315-001: Principles of Neurobiology

INSTRUCTOR:	Jorge Golowasch (golowasch@njit.edu)
OFFICE HOURS:	T: 2:30 - 3:45 pm, F: 2:30 - 3:45 pm - CKB 337B
COURSE SCHEDULE:	T, F: 4:00 - 5:25 pm in CKB 315 **COURSE WEBSITE:** http://moodle.njit.edu/ (Use NJIT email)

COURSE SUMMARY:

This introductory-level course will review the basic principles of how neurons, synapses and neuronal circuits function. We will start at the molecular level and work our way up to discuss behavior and general systems-level issues (development of the nervous system, memory, etc).

TEXTBOOK:

"The Neuron: Cellular and Molecular Biology", 3rd ed, by Levitan & Kaczmarek, Oxford University Press. 2002; ISBN 0-19-514523-2. Be sure to have access to Moodle (http://moodle.njit.edu/, login with UCID; 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: electrical properties, molecular properties, development, plasticity, sensory-motor integration, etc),
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 and integrate,
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 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

GRADING POLICY & SCALE:

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

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.*

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SCHEDULE AND COURSE OUTLINE: Dates listed by week; class will meet twice every week, unless otherwise noted. This course outline is tentative. It will vary depending on how the class evolves through the semester.

WEEK / DATES		LECTURE TOPICS	BOOK CHAP
Week 1	1/20 & 1/23	Entrance quiz • Introduction • Principles of signaling and organization of the nervous system • Putting together a network that can produce a behavior	Chap 1 and 2
Week 2	1/27 & 30	Review entrance quiz • Nerve Cells, Anatomy and Physiology • Glial cells • The Membrane • General electrical properties of excitable cells • Techniques • Intracellular transport • Synapses (chemical and electrical) • Functional architecture of cortex *[Jan 26: last day to Add/Drop a class]*	Chap 2 Chap 3
Week 3	2/3 & 2/6	Electrical properties of cells • Resting potential • Neuronal electrophysiology • Interpretation of an I-V graph	Chap 3 Chap 4
Week 4	2/10 & **2/ 13**	Ionic channels and ion currents. **MIDTERM 1 (Feb 13)**	Chap 4
Week 5	2/17 & 2/20	Ion channels are proteins • Ion Channels and Gating, signaling	Chap 5
Week 6	2/24 & 2/27	Action potentials generation • Ion transport	Chap 6
Week 7	3/3 & 3/6	Passive properties • Action potential propagation	Chap 3
Week 8	3/10 & **3/13**	Diversity of ions channels and function **MIDTERM 2 (Mar 13)**	Chap 7
Week 9	3/24 & 3/27	Neuronal communication: Electrical synaptic transmission • Secretion, exocytosis	Chap 8
Week 10	3/31	Ca^{++} hypothesis Transmitter synthesis • Quantal release	Chap 9 , 11
Week 11	4/7 & 4/10	Indirect transmission • Neurotransmitters and modulators	Chap 12
Week 12	4/17 & **4/17**	Neuromodulation, pasticity **MIDTERM 3 (April 17)**	Chap 13, 18
Week 13	4/21 & 4/24	Sensory systems: visual, auditory	Chap 14
Week 14	4/28 & 5/1	Circuits and complex behaviors	Chap 19
Week 15	5/5	Neuronal development • Cell growth	Chap 16, 17
FINAL EXAM WEEK: MAY 8-14 (FINAL EXAM DATE/PLACE TBA)			