NJIT BIOLOGY

Course Syllabus

SPRING 2017

BIOLOGY 347-002: LAB APPROACHES IN NEUROSCIENCE

INSTRUCTOR:	Dr. Dirk Bucher ▪ bucher@njit.edu	**INSTRUCTOR:**	Dr. Eric Fortune ▪ efortune@njit.edu
OFFICE:	Central King Bldg.	**OFFICE:**	Central King Bldg.
OFFICE HOURS:	W: 2:00pm – 3:00pm	**OFFICE HOURS:**	M: 2:00pm – 3:00pm
COURSE SCHEDULE:	W: 10:00AM – 12:55PM ▪ CKB 326		

COURSE DESCRIPTION: This course is designed to give students a hands-on experience with experimental approaches to understand nervous system function, mostly with electrophysiological techniques. Neurophysiology is a dramatic experience – students will learn how to amplify, record, hear, and analyze bioelectric signals from excitable cells. A laboratory course with a focus on neurophysiology is a critical pillar in neuroscience training and will also serve students that are interested in medicine, engineering, and bioengineering.

COURSE PREREQUISITES:

Basic knowledge of neurophysiology is recommended.

REQUIRED TEXT:

There is no specific textbook assigned. Any Neuroscience textbook students have from their prior courses will do, for example "From Neuron to Brain", 5th ed, Nicholls et al.; Sinauer 2012; ISBN 9780878936090, or "Principles of Neurobiology", 1st ed, Luo, Garland Science 2016; ISBN 9780815344926. Be sure to have access to Moodle2, login with UCID).

IMPORTANT RULES COURSE POLICIES:

- **Academic Integrity:** The University Code on Academic Integrity is strictly enforced! (Academic Integrity Code▪ http://www.ncas.rutgers.edu/oas/ai).
- **Electronic Devices:** The use of cell phones and other electronic devices during class or exam times is prohibited.
- **Attendance and Participation:** Attendance of lectures and studying the lab manual before each lab is crucial. If students miss lectures or are clearly unprepared, the instructors reserve the right to exclude the students from the exercises.

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GRADING POLICY:

GRADING	POINTS
Attendance, Participation	25%
Lab Reports	25%
Presentation I & II	50%
TOTAL	**100%**

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

LEARNING OUTCOMES

STUDENTS WILL BE ABLE:

- To gain hand-on experience and methods and techniques for measuring electrical and chemical signaling within and between nerve cells.
- To gain experience in experimental and theoretical approaches used to study neurophysiology, both for basic research and medical diagnostics.
- To understand fundamental principles of how the nervous system uses electrical activity to encode and decode information about the outside world and internal states.
- To further develop critical thinking and communication skills, measured in the ability to generate and interpret graphs and experimental designs. Students will be required to present their experimental results in a concise, quantitative way. Each student will also give two oral presentations on topics from the primary literature.

COURSE OUTLINE: ***Tentative*** *Class will meet twice every week, once for a lecture, and once for a lab, unless otherwise noted.*

LECTURE TOPICS	LAB
Introduction and course overview	Introduction to Equipment and Software
Bioelectricity	Electrocardiogram
Sensorimotor Integration and Behavior	Electrosensory Behavior in Weakly Electric Fish
Action Potentials	Spike Propagation in Earthworm Giant Axons
Sensory Transduction	Crayfish Electroretinogram
Principles of neural coding	Spike Coding in The Crayfish Stretch Receptor
Synapses and short-term plasticity	Synaptic Potentials At The Crayfish Neuromuscular Junction (NMJ)
Neuronal Excitability	Intrinsic Neuronal Properties in Leech Ganglia
Networks and neuromodulation	Neuromodulation of Leech Neurons
Optical methods	Calcium Imaging in C. elegans
Behavior and movement	Movement
FINAL EXAM WEEK: MAY 5-11, 2017	