

BIOL 3358: Cellular and Molecular Neuroscience – Spring 2019

Instructor
Eleni Anni, PhD
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Eleni.Anni@temple.edu

Office Hours
Friday 2:00 am - 5:00 pm by appointment.
Email through Canvas to schedule appointment.

Class meetings
Monday/Wednesday/Friday 10:00-10:50 am
January 14 – April 29
332 BioLife Building

Prerequisites
BIO3096 “Cell Structure and Function” or permission of instructor

Textbook
“From Neuron to Brain” by John G. Nicholls et al.
Sinauer Associates, Inc.
ISBN: 978-0878936090
The textbook is on reserve in the Paley Library.

Power point slides with notes of each lecture and related material (journal articles, videos, etc.),
and student presentations will be posted on Canvas.

Course Description
The primary focus of the course is on how neurons communicate and form the circuits that
underlie simple and complex behaviors as well as how circuitry defects cause neurological
diseases. The course examines specifically how the flow of ions provides the foundation for
membrane potential and the generation of electric signals in neurons, in concert with the diverse
groups of ion channels and pumps. In addition, the molecular physiology of synaptic transmission
and plasticity will be discussed.

Course Objectives
Students taking this course will learn how electrical excitability and synaptic function of nerve
cells is generated, and how those properties are used for coding information and higher order
function in the nervous system. Moreover, cellular and molecular processes in neurological
pathologies in humans will be discussed.
Learning Outcomes
By the end of this course students should be able to:

- Understand the specifics of ion flow and contribution to the basis of electrical signaling in the nervous system.
- Appreciate the diversity of ion channels and postsynaptic receptors.
- Recognize the mechanisms of synaptic transmission.
- Understand how these basic cellular and molecular components integrate to encode and decode information about the outside world and internal states, and to form the foundation for complex behaviors, such as learning and memory.

Course Requirements
This is a lecture course that requires active engagement of students in class through discussion sessions to organize acquired knowledge. Readings of assigned material should be done before class meetings. Students may present in class primary scientific literature on current high-impact topics in the field for extra credit.

Students are required to attend all classes. If a student arrives late, he/she should stay at the back row seats not to disturb the class. Students will be marked absent when they are not available before the register is taken away, mostly 5 or 10 minutes within the start of the session. If circumstances prevent a student from attending a lecture, or arriving on time, please notify the instructor in advance.

Quizzes and Exams
Quizzes and exams will consist of a combination of multiple choice, true-false, fill-in-the-blank questions and short answers. All tests will include 20% additional questions. Tests will be reviewed in class the following week. Grades for the course will be posted on Canvas. Missed tests will NOT be rescheduled.

Final grade (letter) will be based on:

- Quizzes (2/1, 2/22, 4/12) 35 points
- Midterm exam (3/22) 25 points
- Final exam (5/3; 8:00-10:00am) 30 points
- In-class participation 10 points

Course Policies
Use of cell phones in classroom is NOT permitted.
A number of surveys and studies suggest that cell phones use in classroom is a distraction for the user but also to neighboring students. Data show that cell phones use in classroom results in decreased ability to paying attention, taking lower quality notes, retaining less information and doing worse on tests about the material (see e.g. Mayer and Moreno, 2010; Rosen et al, 2011; Kuznekoff and Titsworth, 2013).
Student and Faculty Academic Rights and Responsibilities
Freedom to teach and freedom to learn are inseparable facets of academic freedom. The policy can be accessed through the following link: http://policies.temple.edu/PDF/99.pdf

Academic Honesty and Plagiarism
Any form of academic dishonesty — plagiarism and cheating — is as unacceptable in this course as it is across the University and throughout higher education. Plagiarism is defined in the Bulletin as “the unacknowledged use of another person's labor, another person's ideas, another person's words, and another person’s assistance. The policy can be accessed through the following link: http://policies.temple.edu/PDF/398.pdf

Disability Disclosure Statement
Any student who has a need for accommodation based on the impact of a documented disability, including special accommodations for access to technology resources and electronic instructional material required for the course, should contact me privately to discuss the specific situation as soon as possible. You may also contact Disability Resources and Services (DRS) at 215-204-1280 in 100 Ritter Annex to learn more about the resources available to you. Reasonable accommodations for all students with documented disabilities will be provided by the DRS in coordination with the instructor. The policy can be accessed through the following link: https://disabilityresources.temple.edu/

Technology Usage Policy
Read Temple University’s Technology Usage policy which includes information on unauthorized access, disclosure of passwords, and sharing of accounts. The Temple University Technology Usage Policy can be accessed at https://computerservices.temple.edu/technology-usage-policy

Resources
Access your course materials at Canvas (canvas.temple.edu), Databases, journal articles, and more at Temple University Libraries (http://library.temple.edu/); Obtain 24/7 technology assistance at Computer Services Helpdesk (https://computerservices.temple.edu/lab/contact-us).
# Tentative Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Tests</th>
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<tbody>
<tr>
<td>1</td>
<td>1/14 - 1/18</td>
<td>Principles of signaling and organization</td>
<td>Chapter 1</td>
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<tr>
<td>2</td>
<td>1/21 - 1/25</td>
<td>Ion channels and signaling</td>
<td>Chapter 4</td>
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<td>3</td>
<td>1/28 - 2/1</td>
<td>Structure of ion channels</td>
<td>Chapter 5</td>
<td>Quiz 1</td>
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<tr>
<td>4</td>
<td>2/4 - 2/8</td>
<td>Ionic basis of the resting potential</td>
<td>Chapter 6</td>
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<td>5</td>
<td>2/11 - 2/15</td>
<td>Ionic basis of the action potential</td>
<td>Chapter 7</td>
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<td>6</td>
<td>2/18 - 2/22</td>
<td>Electrical signaling in neurons</td>
<td>Chapter 8</td>
<td>Quiz 2</td>
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<td>7</td>
<td>2/25 - 3/1</td>
<td>Ion transport across cell membranes</td>
<td>Chapter 9</td>
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<td>8</td>
<td>3/4 - 3/8</td>
<td>SPRING BREAK</td>
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<td>9</td>
<td>3/11 - 3/15</td>
<td>Properties and functions of neuroglia</td>
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<td>10</td>
<td>3/18 - 3/22</td>
<td>Direct synaptic transmission mechanisms</td>
<td>Chapter 11</td>
<td>Midterm</td>
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<td>11</td>
<td>3/25 - 3/29</td>
<td>Indirect synaptic transmission mechanisms</td>
<td>Chapter 12</td>
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<td>4/1 - 4/5</td>
<td>Neurotransmitters release</td>
<td>Chapter 13</td>
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<td>13</td>
<td>4/8 - 4/12</td>
<td>Neurotransmitters in the CNS</td>
<td>Chapter 14</td>
<td>Quiz 3</td>
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<td>14</td>
<td>4/15 - 4/19</td>
<td>Neurotransmitters: Synthesis, transport,</td>
<td>Chapter 15</td>
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<td>storage and inactivation</td>
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<td>15</td>
<td>4/22 - 4/26</td>
<td>Synaptic plasticity</td>
<td>Chapter 16</td>
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<td>16</td>
<td>4/29 - 5/3</td>
<td>Autonomic nervous system</td>
<td>Chapter 17</td>
<td>Final exam</td>
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