**Biol/Neur 256 Neurobiology**

**Spring 2023**

**Instructor:** Dr. Tamara Stawicki

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**Office Hours:** Tuesdays 11:30am-12:30pm and Thursdays 3:00-4:00pm or by

appointment: <https://calendly.com/stawickt/meeting-with-dr-stawicki>

You can attend office hours either in person in my office, Oechsle Hall 309A, or via zoom at the following link: [https://lafayette.zoom.us/j/92191001788?pwd=Y1BXVkRydHduUHYvSEdrV1FkTTc3QT09](https://www.google.com/url?q=https://lafayette.zoom.us/j/92191001788?pwd%3DY1BXVkRydHduUHYvSEdrV1FkTTc3QT09&sa=D&source=calendar&ust=1674066662005292&usg=AOvVaw18M1201-aYnWMfjkDRM9Na)

**Class Meetings:** Lecture = Tuesday/Thursday 9:30 - 10:45 am Oechsle Hall 224

or Tuesday/Thursday 1:15 – 2:30 pm Oechsle Hall 211

Lab = Wednesdays 8:00 - 10:50am or 1:10 - 4:00pm

Rockwell 134

Please make sure to attend the lab and lecture section you are registered for unless you have prior approval from me to attend the other section

**Textbook:** There is no required textbook for this class. In place of a textbook I will be posting readings from open education textbooks, videos, simulations, etc on the course website. If you would like to read a physical textbook in conjunction with the material presented in class I would recommend the following:

*Neuroscience: Exploring the Brain* (4th edition)

Bear MF, Connors BW, Paradiso MA

#### ISBN: 9781284211283

We will also be using a SimUText simulation of neuronal activity in the first part of the course. I have posted a document on Moodle for you explaining how to obtain this program for your computer. The cost is $6.00. This program will be installed on the lab computers if you do not have a computer you can install it on, however you will still need to purchase access to use the software.

**Course Website:** <https://moodle.lafayette.edu>

All assignments and readings will be posted on the course website. It is your responsibility to visit the website regularly.

Moodle privacy statement: Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA).  Disclosure to unauthorized parties violates federal privacy laws.  Courses using Moodle will make student information visible to other students in this class.  Please remember that this information is protected by these federal privacy laws and must not be shared with anyone outside the class.  Questions can be referred to the Registrar's Office.

**Course Description:**

This course examines the field of neuroscience with a particular focus on how the nervous system functions at a cellular and molecular level. After a review of basic neuronal cell biology, the course will examine the means by which these highly differentiated cells mediate information flow through synaptic transmission and circuitry. Finally, we will examine the development of the nervous system and the interaction of genetics and environment that constantly fine-tunes nervous system function throughout life.

**Course Objectives:**

Through completing the assigned readings and assignments as well as participating in lab and class activities students will

* Learn about how the nervous system functions at a cellular and molecular level
* Discuss primary literature articles
* Conduct experiments in the lab to reinforce what they have learned in lecture
* Develop novel hypotheses and design experiments to test them

**Course Learning Outcomes:**

At the end of this course students will be able to:

* Demonstrate an understanding of the following concepts:
  + The cell biology of neurons
  + The electrical properties of neurons
  + The generation and propagation of action potentials
  + Synaptic transmission between neurons
  + Roles of neuronal molecules such as ion channels, neurotransmitters and receptors
  + The role and organization of neuronal circuits
  + The development of the nervous system
  + Postnatal modification of the nervous system and its mechanism
* Read and analyze primary scientific literature.
* Develop a hypothesis, design and conduct an experiment to test that hypothesis, and analyze the results.

**Class format:**

This course includes two components lecture and sessions.

Lecture sessions will feature a combination of lecture, problem solving, and group discussion as we learn the fundamentals of neurobiology. I will present material using both PowerPoint slides and the doc cam. I will regularly be asking you questions that you will work on both independently and in small groups to assure that you are actively participating in the learning process. You should also feel free to stop me at any point during class with questions you may have relevant to the course material. Before each class session readings and/or videos, an outline and lecture slides will be posted on the moodle website. It is expected that you will look at the posted material **before** class and come prepared to discuss it. If you are seeing the material for the first time during class it will be difficult to keep up. After each class session you will complete a handout with some problems relating to what was learned in class, time permitting I will dedicate some time in class to working on these. These will be due by the next class session and graded based on completion not accuracy. You are welcome to work with your classmates on these handouts.

I will be using random call during lecture. I believe this is the best method to hear from a wide range of voices. This allows me to more accurately gauge how well you are understanding the material and gives you a chance to practice speaking in front of a group in a low stake setting. However, I realize the fear of being randomly called upon can be very stressful for some students and deter from their learning. If at any time you would like to be removed (or re-added) to the random call list simply e-mail me and let me know. You will not be penalized for doing so.

Lab sessions will be used to enhance what you have learned in the lecture section of the course through carrying out simulations and getting to use electrophysiology, histology and behavioral techniques. Each week I will post a handout for the lab activity we will be completing each week. Before the lab session it is expected you will do the following:

1. Read through the lab handout and make sure you understand what you will be doing.
2. Review any posted information on moodle that is pertinent to the lab.

To complete the laboratory exercises within the scheduled 3 hours, it is imperative that you arrive at the lab having previously reviewed the laboratory instructions and understand what is going to be accomplished that day and what is required of you for each exercise. I will make general announcements and briefly outline the day’s events at the beginning of the lab section and then you will work on the lab activity in small groups. It is expected that you will complete the lab handout during the scheduled lab period and turn it in before leaving.

Most of the time you will work with other students in the lab and I expect students to cooperate and share observations. This collaboration should be documented in your lab handout. However, I expect each student to record individually their observations and prepare their lab handouts independently. Any questions about this policy should be directed to me at the beginning of the semester.

**Potential Disruptions to In Person Learning**

While I hope we can have as normal a semester as possible, there is always a chance that the ongoing pandemic or mother nature may have other ideas. If you believe you may have a contagious illness you should not attend class. You will not be penalized for your absence as long as you give me advanced notice and/or get a Dean’s Excuse. I plan on recording class sessions and will post these recordings on Moodle, so you can keep up with the material. For missed lab activities, you must get prior permission from me or a Dean’s Excuse to miss the lab to be allowed to make it up, otherwise you will get a zero for that lab. If you do get permission to complete a makeup lab we will either arrange a time for you to makeup the lab in person or I will give you an alternative virtual lab to complete instead, it will be up to my discretion which of these makeup options you are given. If you are not able to take an exam as scheduled you must get a Dean’s Excuse.

It is also possible the class and/or lab may need to be temporarily switched to a virtual mode of delivery due to me being sick, a significant number of students being unable to attend in person, or inclement weather. If this does happen I will e-mail you to notify you what the plan is and to provide the relevant zoom links. Please check your e-mail regularly in case this happens.

**Evaluation and Grading:**

Grades will be assessed by a combination of assignments and exams as outlined below.

Exam I (2/21) 17%

Exam II (4/4) 17%

Exam III (during finals) 17%

Homework 10%

Infographic Project (3/26) and Presentation (3/30) 10%

Laboratory Activities 15%

Research Project and Presentation (5/3) 14%

Final grades will be determined by the following scale:

|  |  |  |  |
| --- | --- | --- | --- |
| **Grade** | **Percentage** | **Grade** | **Percentage** |
| A | 93.0 to 100 | C | 73.0 to 76.9 |
| A- | 90.0 to 92.9 | C- | 70.0 to 72.9 |
| B+ | 87.0 to 89.9 | D+ | 67.0 to 69.9 |
| B | 83.0 to 86.9 | D | 63.0 to 66.9 |
| B- | 80.0 to 82.9 | D- | 60.0 to 62.9 |
| C+ | 77.0 to 79.9 | F | 0.0 to 59.9 |

**Please note that out of fairness for all students, final grades will not be bumped or rounded up or down. There will also be no additional opportunities for extra-credit towards your final grade beyond those mentioned in class for all students.**

**The Importance of an Inclusive Classroom**

I would like to create a learning environment for my students that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.) To help accomplish this:

* If you have a name and/or set of pronouns that differ from those that appear in the class roster, please let me know. Additionally, please let me know if I am mispronouncing your name.
* If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. If you do not feel comfortable discussing the issue directly with me, I encourage you to seek out another, more comfortable avenue to address the issue. You may want to consider contacting your class dean (<https://advising.lafayette.edu/class-deans/>) or the counseling center (<https://counselingcenter.lafayette.edu/>).
* If any of our class meetings or assignments conflict with your religious events please let me know during the first two weeks of the semester so we can make arrangements for you.
* If you have suggestions to improve the effectiveness of the course for you personally or other students or student groups please let me know.
* I (like many people) am still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.

**Resources for Student Support**

There are a number of resources available to support your learning at Lafayette. The following link <https://spaces.lafayette.edu/enrol/index.php?id=1276> provides access information on available offices and programs for academic support. Additionally, the Counseling Center (<https://counselingcenter.lafayette.edu/>) is available to provide counseling and educational programs to help you achieve your academic, social and personal development goals.

**Disability statement:**

In compliance with Lafayette College policy and equal access laws, I am available to discuss appropriate academic accommodations that you may require as a student with a disability. Requests for academic accommodations need to be made during the first two weeks of the semester, except for unusual circumstances, so arrangements can be made. Students must register with Accessibility Services Office, which is housed in the Academic Resource Hub ([resourcehub@lafayette.edu](mailto:resourcehub@lafayette.edu)) to receive accommodations. Eligibility for, and provision of accommodations may be influenced by the changes to the academic environment that are necessitated by the COVID-19 pandemic. If you are in need of accommodations, or adjustments to your accommodation plan, it is your responsibility to contact  Accessibility Services immediately to discuss your needs.

**Proper Usage of Course Materials and Classroom Recordings**

At Lafayette College, all course materials are proprietary and for class purposes only. This includes posted recordings of lectures, worksheets, assignments, and other course items. Reposting such materials or distributing them through any means is prohibited. If you have any questions about proper usage of course materials please ask me.  Please also be in contact with me if you have any concerns with being recorded during the course.

**Academic Integrity:**

All students are expected to abide by the Student Code of Conduct including policies around academic integrity. Please be sure to review the Student Code of Conduct at the following link (<https://conduct.lafayette.edu/student-handbook/student-code-of-conduct/>). If you have any questions on when collaboration is allowed or what sources you are allowed to use as it pertains to abiding by the Student Code of Conduct please contact me.

**Compliance statement:**

The student work in this course is in full compliance with the federal definition of a four-credit hour course. Please see the Registrar’s Office web site (<https://registrar.lafayette.edu/wp-content/uploads/sites/193/2013/04/Federal-Credit-Hour-Policy-Web-Statement.doc>) for the full policy and practice statement.

**Course Schedule**

You are expected to complete the preparation material prior to coming to class. The schedule of covered material may change as the course progresses. Every effort will be made to not change exam dates and major assignment due dates, however, they may need to be shifted if in person gathering is not feasible on the scheduled dates or due to other unforeseen circumstances.

|  |  |  |
| --- | --- | --- |
| Week | Day | Topic |
| 1 | 1/24  1/26 | Introduction to the course and organization of the nervous system  Neuronal cell biology |
| 2 | 1/31  2/2 | Basic electrical properties of neurons – Equilibrium Potentials  Basic electrical properties of neurons – Resting Membrane Potentials |
| 3 | 2/7  2/9 | Action potential generation  Action potential measurement |
| 4 | 2/14  2/16 | **Virtual Class:** Molecular basis of action potentials  Ion channel mutations and evolution |
| 5 | 2/21  2/23 | **Exam 1**  Action potential propagation and multiple sclerosis |
| 6 | 2/28  3/2 | Action potential propagation (paper discussion)  Neural Circuits |
| 7 | 3/7  3/9 | Synaptic Transmission - Presynaptic  Synaptic Transmission - Postsynaptic |
| 8 |  | No Class – Spring Break |
| 9 | 3/21  3/23 | Fast Neurotransmission: GABA & Glutamate  Slow Neurotransmission |
| 10 | 3/28  3/30 | Fast and Slow Neurotransmission (paper discussion)  **Infographic Presentations (Files due 3/26)** |
| 11 | 4/4  4/6 | **Exam 2**  Early Neural Development |
| 12 | 4/11  4/13 | Genesis of Neurons and Connections  Axon Pathfinding and Synapse Formation |
| 13 | 4/18  4/20 | Nervous System Refinement  Synaptic Plasticity |
| 14 | 4/25  4/27 | Adult neurogenesis (paper discussion)  Aging and Neurodegenerative diseases |
| 15 | 5/2  5/4 | Epigenetics and the Nervous System (paper discussion)  Course wrap-up |

**Exam 3 During Finals**

**Lab Schedule**

|  |  |  |
| --- | --- | --- |
| **Week** | **Day** | **Lab** |
| 1 | 1/25 | No scheduled lab |
| 2 | 2/1 | **Lab 1:** Neural Cell Biology and Anatomy |
| 3 | 2/8 | **Lab 2:** Neuronal Activity Modeling |
| 4 | 2/15 | No lab: Professor Stawicki at ARO Conference |
| 5 | 2/22 | **Lab 3:** Using Action Potentials to Encode Information |
| 6 | 3/1 | **Lab 3 (continued):** Using Action Potentials to Encode Information |
| 7 | 3/8 | **Lab 4:** Neuronal Circuits |
| 8 |  | No lab: Spring break |
| 9 | 3/22 | **Lab 5:** Gene expression in the brain |
| 10 | 3/29 | **Lab 6:** Behavioral analysis of genetic mutants |
| 11 | 4/5 | Research project - Design your experiment |
| 12 | 4/12 | Research project - Data collection |
| 13 | 4/19 | Research project - Data collection |
| 14 | 4/26 | Research project - Data analysis/presentation work |
| 15 | 5/3 | Research project – **Presentations** |