

BIO/PSY 350: Foundations of Neuroscience 1

Instructors

Dr. Stacey Dutton

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BSC 203 East

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Office Hours: Monday 10 – 11 AM or by appointment. Sign-up for time slots on Compass. All via Zoom.

Dr. Jennifer Larimore

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Office hours: Zoom Appointment Only; Sign up on Canvas for a time slot - 1PM – 2PM is set aside on T/TH for zoom appointments. If those times don't work, send an email with 3 time options and I will let you know what works.

Labs: (zoom links on Canvas homepage)

Tuesday: Dr. Dutton 2:00 – 5:00 PM

Wednesday: Dr. Larimore 2:00 – 5:00 PM

Class:

Tuesday & Thursday 11:30 -12:45 AM

Zoom ID: <https://agnesscott.zoom.us/j/92013221571>

Required Text and Materials:

1. Neuroscience. Purves et.al. 6th edition. Oxford University Press
2. Neuroscience Basics. Larimore. 1st Edition. Academic Press
3. A Handbook of Biological Investigation. Ambrose, Ambrose, Emlen and Bright. 7th Edition

Course Description:

This course examines foundational principles in cellular neuroscience. This includes the electrophysiological nature of neuronal cells, their structure and function, and the various extracellular and intracellular messages used to communicate in the nervous system.

Course Objectives:

Upon successful completion of this course, the student will achieve the following objectives:

- Demonstrate knowledge of the structure and function of the different types of cells in the nervous system
- Demonstrate understanding of the electrophysiological nature of neurons.
- Design an experiment, analyze the results, draw conclusions, and report on the research both with scientific writing and an oral presentation.
- Critically read and evaluate primary scientific literature.
- Utilize effective teamwork to problem solve in an inquiry-based research laboratory project.

Skill Objectives: Skills you will gain from this course that advance your development as a scientist (and you can put on your CV and personal statements).

1. Critical thinking/Problem Solving – through weekly article analysis, students will be able to critically read and evaluate scientific literature. Through designing experiments and inquiry-driven laboratory experiences, students will sharpen their ability to think critically about neuroscience.
2. Oral Communication – through article presentations and lab poster presentations, students will demonstrate their abilities to present scientific findings to a broad audience.
3. Written Communication – through weekly assignments and the Grant pre-proposal, students will demonstrate their ability to write scientifically.
4. Teamwork/Collaboration – working with a lab team as well as a team for presentations will enable the students to practice real-world teamwork and leadership competencies that are taught as a part of SUMMIT.
5. Digital Technology – students will learn how to navigate various online resources to complete assignments and collaborate with peers. Students will actively use CITI, Canvas, PubMed, Google Drive and Power point.
6. Research Skills – as a result of this course, students can design an experiment, analyze the results, draw conclusions, and report on the research both with scientific writing and an oral presentation. The laboratory portion of this course is designed to enhance the learning in the lecture as well as progress the career of each student as a scientist.
7. Career Management – at the end of this course, there is a day to add the relevant skills gained from this course to a student’s CV or resume. Additionally, there will be time to work on personal statements and discuss cover letters.

General Course information:

***To preserve the integrity of the classroom experience and to protect students’ privacy, which we are legally required to do, only students registered in the course may attend a Zoom class meeting.

ONLINE AND HYBRID EXPECTATIONS

Online and hybrid classes allow for flexibility and convenience. But online and hybrid classes require certain learning traits from you, the student.

1. Persistence and independence – You need to work daily on every class and persist through challenges. When you run into a challenge, make sure you seek help! Remember this is your education and only yours. What you put into it is what you get out of it.
2. Effective Time-Management. Because you need to spend time daily on this class, make sure you schedule that time to make sure you manage your time well! Develop a daily to do and a long term plan for completing the major assignments.
3. Remember that your professors want to help – but as we are wearing masks or on zoom, we may not pick on the usual non-verbal cues students give us. In a typical classroom, we pick up on confused looks or blank stares. As we don’t have those cues, reach out! Email or talk to your group or a learning assistant. Engage with the online discussions!
4. Be aware of the software needs and make sure you know how to navigate those programs required for the course. Reach out to ITS or a friend or a YouTube how to video for the software/programs for the class.
5. When you are engaging in course material, find a good study space. Turn off your cell phone, be in a comfortable space, minimize any distractions, no TV or games, etc.

Technology: Cell phones should be in the silence mode prior to entering the classroom or lab.

STUDY !

Purpose and Plan:

Why are you taking this class? What purpose does this class serve for you? What are your personal goals for this class? What will it take to achieve these goals? Why are these goals important to you? You need to be able to answer these questions for each class you take – because the work will get hard and you will need to remind yourself what you are aiming for at the end of the semester. Set your goal and then make a plan to achieve that goal.

Good Habits: Learning throughout the semester:

Preparing for tests and actually learning the material is made infinitely easier and more enjoyable if you establish an organized system for approaching the lecture and reading material early on in the semester.

SCHEDULE time!

Based on assignments for both lecture and lab, you will spend 8-10 hours studying for this class outside of class time. Please come see your instructor early in the semester if you are struggling.

Add time to your Google Calendar each week for this course. Those time slots will vary based on your level of understanding, but in general, they should be about an hour each.

A time slot to:

- (1) read the assigned reading and take notes on it,
- (2) listen to the lecture and take excellent notes,
- (3) complete the DRQ ahead of time in case you have questions you need to ask before submitting it,
- (4) to meet with your study group to review the lecture and prepare for the quiz. Each lecture topic should have 4 time slots, and
- (5) to complete the bigger projects. Schedule several different time slots for the semester projects/assignments to give yourself plenty of time to work on these assignments (and so they don't sneak up on you).

Do not change those times. Make those times a habit - time that is carved out for this class and your success.

Academic Honesty: You are responsible. Scientists must conduct themselves with the utmost integrity at all times. By placing your name on ANY assignment, you are stating that you completed that assignment with academic honesty. Violations of the honor code result in outcomes ranging from failure of the assignment, failure of the course, to expulsion from the college. You should speak with your professors if you need clarification about any of these policies.

Academic dishonesty is reported to medical schools and graduate schools per their request.
Anyone who engages in dishonest conduct relinquishes the privilege of asking for a letter of

recommendation from the professor and will receive a 0 on the assignment. Any act of academic dishonesty will be turned over to Honor Court.

Plagiarism: do attribute all ideas taken from other sources; this shows respect for other scholars. Plagiarism can include portraying another's work or ideas as your own, buying a paper online and turning it in as if it were your own work, or not citing or improperly citing references on a reference page or within the text of a paper. Passing off someone else's work as your own represents intellectual fraud and violates the core values of our academic community. Plagiarism is passing off any work that is not yours as your own work ** EVEN WITH A CITATION***. If you are using a source and citing the source, the information from that source STILL must be reworded in your own voice. Putting a citation behind a statement gives ownership to that source, but, if you do not reword that information, it is plagiarism. Do not cut and paste from the slide, your book, your neighbor, Wikipedia, or the internet. To further your science education, you need to be able re-word science in your own voice. If your answers are not your own, you will receive a 0 for the assignment. All cases of academic dishonesty will be turned into Honor Court.

Intellectual Fraud: do not falsify or create data and resources or alter a graded work without the prior consent of your professor. This includes making up a reference for a works cited page or making up statistics or facts for academic work.

Cheating: do not allow another party to do your work, exam, or submit the same or similar work in more than one course without permission from the course instructors. Cheating also includes taking an exam for another person, looking on another person's exam for answers, using exams from previous classes without permission, or bringing and using unauthorized notes or resources (i.e., electronic, written, or otherwise) during an exam. Cheating also includes when you help another student complete a take home exam, give answers to an exam, talk about an exam with a student who has not taken it, or collaborate with others on work that is supposed to be completed independently.

Course Communication: Instructors will make announcements regularly via email. *It is your responsibility to check your Agnes Scott email account daily.* When responding to a professor over email, take care that your email is professional. Examples here:

<https://medium.com/@lportwoodstacer/how-to-email-your-professor-without-being-annoying-af-cf64ae0e4087#.jldd3bxes>

Course Evaluations: At the end of the semester you will receive an email asking you to submit an evaluation of the course. Please give feedback! Your input is important to the college as a whole and to us as instructors.

ADA: If you have a disability that may have some impact on your work in this class and for which you may require accommodations, please contact the Office of Academic Advising (404-471-6150) to register for services. Students that receive accommodation checklists, please meet with me to discuss the provisions of those accommodations as soon as possible.

Title IX: Agnes Scott is here to help you if you have experienced any form of sexual harassment or violence, dating or domestic violence, or stalking. Please talk to any faculty or staff member

with whom you feel comfortable. Faculty and staff members want to support you and have been trained to help. They will also inform the Title IX office so that you learn about options available to you. If you do not want college administrators to know what you have experienced, you may talk to the chaplain, as well as nurses or counselors in the Wellness Center in complete confidentiality. They will not tell anyone what you share with them unless you give your express permission.

For the safety of the entire community, any incidence of or information about sexual misconduct must be reported immediately to Title IX Coordinator Karen Gilbert (kgilbert@agnesscott.edu, 404-471-6435) or Deputy Title IX Coordinator Karen Goff (kgoff@agnesscott.edu, 404-471-6449).

Inclusion: This course adheres to the principles of diversity and inclusion integral to the Agnes Scott community. We respect people from all backgrounds and recognize the differences among our students, including racial and ethnic identities, religious practices, and gender expressions. We strive for our campus to be a safe space in which all students feel acknowledged and supported. At the same time, we understand that course content, critical inquiry, and classroom dialogues give us opportunities to examine topics from a variety of perspectives. Such discourse is a defining feature of a liberal arts education, and can compel debates that challenge beliefs and positions, sometimes causing discomfort, especially around issues related to personal identities. While we uphold and preserve the tenets of academic freedom, we request and invite your thoughtful and constructive feedback on ways that we can, as a community of learners, respectfully assist and challenge one another in our individual and collective academic work.

Content Warning: This course will explore the human brain and behavior, which might raise issues of racism, sexism, classism, heterosexism, cissexism, ableism, and other kinds of privilege. I invite you to come see me if want more information. If you feel you will be unable to fully participate in the course requirements, set up a meeting with the course instructor to determine appropriate accommodations.

Deadlines: Attendance and participation will be assessed periodically to determine your engagement and commitment to this class. Students are expected to attend all class periods, except in cases of documented illness or emergency. If a missed class cannot be avoided because of illness or emergency, it is STRONGLY recommended that you contact the instructor IN ADVANCE, or within 24 hours of the class period. Should an emergency or crisis arise, such that you miss class, you must provide legitimate documentation in order for the instructor to consider allowing you to make up missed work. It is your responsibility to keep up with the class material. Thus, if you miss class, it is up to you to find out from a reliable source if you missed an assignment. It is also your responsibility to stay on top of presentation, quiz and exam deadlines. In-class assignments (such as the experimental design projects), presentations, and quizzes will NOT be available to make up later, unless you have a documented excuse, OR you have contacted me ahead of time.

Grading: The final grade for this course will be based on the following:

LECTURE GRADE:	
Exams	100 points (50 points each x 2 tests)
Outline for Final Project + Draft	30 points (20 points for the outline + 10 points for the draft)
Class Final Project	100 points
Article Analysis	60 points (5 points each x 12 articles)
Article Presentations	40 points (20 points each x 2 presentations)
Directed Reading Quest.	24 points (2 points each x 12)
Experimental Designs	12 points (2 points each x 6 assignments)
Quizzes	60 points (5 points x 12)
LAB GRADE:	
Pre-labs/lab notebook check	40 points (5 points x 8)
Lab report homework	25 points (5 points each section)
Lab report	100 points
Lab presentation	20 points

*Additional points or assignments may be added by the instructors

Lectures: Class lectures will be interactive, problem-based learning in teams. Therefore, reading the assigned chapters and listening to the lecture *prior* to class arrival will further your understanding of the material and will prove beneficial to your overall experience within the class. Class lectures can be found in a Google drive folder (link on Canvas). Access is only allowed with your Agnes Scott email address.

Group in Class Work: With a flipped classroom, you will be completing in class group work to apply the knowledge you gained in the recorded lecture. Come to class with your notes, your ARQ and any assigned articles. Your group work will be due 24 hours after class.

Directed Reading Questions (DRQs) or Assisted Reading Questions (ARQs) (used interchangeably) are part of your grade. They function as review questions for each chapter and can assist you in learning the information covered in the lecture. Each DRQ will be posted to Canvas prior to the lecture. They are due prior to lecture (due date time is on Canvas). Turn these questions as a word doc, answer on the word doc assigned, and put your responses in a different color font. Reading questions are worth 5 points per worksheet.

Quizzes (see schedule for tentative dates): We will have short quizzes that are 3-5 questions long. This allows you to study the lectures as we go along; therefore, preventing potential cramming for the tests. Quizzes are open 24 hours prior to lecture, but once you start the quiz, you will only have 30 minutes to complete it. Quizzes are open note, but no book. The quiz is set up for 2 attempts. We will grade the first attempt. The second attempt is in case your internet drops you. Do not use the second attempt unless you need it.

Exams (see schedule for tentative dates): There will be 2 exams during the semester. The exams will be written to assess your understanding of the information covered in class and your ability to apply and analyze the information using higher order thinking skills by answering short answer and essay questions. Your ability to design an experiment and/or critically analyzed data will also be assessed. Exams are open note, but no book. The exams are set up for 2 attempts. We will grade the first attempt. The second attempt is in case your internet drops you. Do not use the second attempt if you need it.

Article Analysis: A peer-reviewed article from primary literature will be assigned every week (see Canvas for articles). The class will submit an article analysis worksheet to Canvas prior to student presentation day (except for the group presenting) – due dates on Canvas. The form is available on Canvas. Answer the questions and load the analysis to Canvas as a word doc. *During the article presentation, if you are engaged in anything other than paying attention to the article analysis, you will receive a 0 on your article analysis. It is expected that you pay attention, engage and learn from the group presenting.*

Group Experimental Design Questions: At the end of some article presentations later in the semester, we will be breaking into the assigned presentation groups. Each group will turn in an experiment at the end of class that takes the article one step further, with a hypothesis, model system, control variables and experimental variables clearly defined. This assignment will be loaded to Canvas after the article presentation. *If you did not pay attention during the article presentation, you will not be allowed to participate and earn the points for the experimental design question.*

Group Article Presentations: The group preparing the article presentation will need to create a PPT, keynote, or Google Slides with the following information (no Prezi):

Introduction section – Provide background information to help our class understand your topic. *Why is this experiment important? What background information will help us understand what was done (reference the papers cited in the introduction)?* Be sure to clearly state the hypothesis and/or experimental question of the article.

Results – Each piece of the results (data) presented must cover the 3 points below or points will be taken off. Any time you present a piece of data, always explain (1) what the audience is looking at, (2) what method you used (if the method is new to the class, explain it in a clear way, potentially using videos or graphics), and (3) what the data mean (your interpretation) and why they are important. Be sure to include a figure legend and a descriptive figure title for each.

Conclusions – Include simple statements to describe the key takeaway points from the experiments and their importance in the field of study. How did the study contribute to the hypothesis?

EACH member of the group must present at least 1 figure. If there are less results figures than there are group members, then use a figure in the introduction from one of the sources cited AND/OR look to show what research has happened since the article was published and present a figure from more current work.

**** Each Group Member MUST submit a PDF of THEIR slides (NOT THE WHOLE PRESENTATION) for grading 24 hours prior to the presentation – there is a spot on Canvas.**

****EACH group MUST submit a recording of the presentation prior to the class day it is due.**

There is a Google drive link on Canvas. On presentation day, the class will log into Zoom and we will watch the presentation together.

ANY information on your slide is FAIR GAME for a question. If you put it on a slide, BE ABLE TO EXPLAIN IT!! We will take off points if you cannot explain something on your slide.

Presentation Tips:

- Less text is better
- diagrams are always helpful
- keep the background information relevant
- keep all additional information relevant
- if it's boring to you, it's boring to your audience
- Do not make the presentation “cutesy”. This is a scientific presentation to your colleagues. Keep it professional.
- Make sure the fonts are the same on all slides, as well as all bullets.
- Formatting should be cohesive and look like 1 person made the presentation.
- The sharpest contrast between font and background is black and white. It makes your words more legible from the back of the room.
- In past years, group members have gained insight and bettered their understanding by meeting with the professor a week or two before the presentation. Do not expect the professor to meet with you outside of office hours the week of the presentation.

A rubric with the grading criteria and breakdown of points is below and is on Canvas.

Criteria	5: Excellent	4: Good	2-3: Fair	1-2: Poor
1. Organization (5)	<ul style="list-style-type: none"> • Clear title • Clearly defined sections • Clear flow of topics • Easy to follow 	<ul style="list-style-type: none"> • Clear title • Sections defined • Generally easy to follow, though may require rereading for clarity 	<ul style="list-style-type: none"> • Title present • Sections unclear or inappropriate • Takes effort to follow thoughts and ideas 	<ul style="list-style-type: none"> • Title unclear or absent • Sections unclear or absent • No flow of ideas • Cluttered, messy
2. Creativity (5)	<ul style="list-style-type: none"> • eye-catching • Diagrams clearly labeled • Good balance of text and graphs or pictures • Engaging use of color 	<ul style="list-style-type: none"> • Neat • Some use of color • Diagrams present • Fair balance of text and graphs or pictures 	<ul style="list-style-type: none"> • Bland • Little or no color • Diagrams absent or unclear • Mainly or all text 	<ul style="list-style-type: none"> • Bland • Boring • No variety in layout • Diagrams absent • Majority is text
3. Science Content (5)	<ul style="list-style-type: none"> • contains all the necessary information to understand the project • Information is explained in a very understandable fashion • No excess information that is distracting • All abbreviations are defined 	<ul style="list-style-type: none"> • contains most of the information necessary to understand the project • Information is explained in a pretty understandable fashion • The majority of the information is not distracting • Most abbreviations are defined 	<ul style="list-style-type: none"> • contains some of the information necessary to understand the project • Information is poorly explained • Excess information is distracting • Some abbreviations are defined 	<ul style="list-style-type: none"> • contains little to no information necessary to understand the project • Information is not explained • Excess information is distracting • abbreviations are not defined
4. Oral presentation (5)	<ul style="list-style-type: none"> • Well-rehearsed without long pauses • clear articulation • appropriate eye contact, voice volume 	<ul style="list-style-type: none"> • Well-rehearsed with some pauses • Articulation, eye contact, voice volume generally adequate 	<ul style="list-style-type: none"> • Obvious lack of rehearsal • Lacking in one of areas: articulation, eye contact, voice volume 	<ul style="list-style-type: none"> • Obvious lack of rehearsal • lack of conveyed information • lacking in one <u>ore</u> more of the following areas: articulation, eye contact, voice volume

Feedback from the professors after the presentation

The professors will **heavily** critique each presentation. This is done with all the respect of an individual presenting and for the benefit of the individual. This is a safe space to grow and only through this constructive criticism can any scientist grow. While the professor's critique in this manner may come across as harsh, this is not the intention and should not be taken personally, as our critique does not reflect our opinion of you.

This may be the first time many are presenting scientific data, and we are fully aware and respect that. Our critiques are meant to aid an individual in becoming the best scientist they can. They are hard critiques that put a student on the spot and may point out a lack of preparation or a lack of understanding. That is not easy to swallow and we understand that.

Again, our goal is to further you as a scientist. We do not call names or poke fun or ridicule. We reflect on the presentation given to us and only that. We remove emotional responses from the equation and report on what was presented. In doing so, each student is able to understand how to advance their presentation skills. Each student can better themselves in an environment where the professors are serving as mentors in this process and are deeply concerned about each student's success. If we did not care about the success, we would not aid students prior to the presentation or have this assignment at all. Feedback in the real world could mean not getting the school or job a student wants. This assignment is meant to improve a student with the goal of reaching their future goals. The feedback given in this assignment is done in a professional manner.

We ask questions about the project. If you met with us before the presentation and we instructed you on a proper way to present some item, if that is not followed through, your grade will be affected. Meeting with the professor before and following through with advice and feedback is the easiest way to prepare for the presentations.

Class Final Project:

For the final in this class, you will be completing a paper that integrates the information you have learned in this class, BIO 110, and BIO 111 under a Neuroscience theme. The goal of this project is to be able to make connections between the major concepts from these courses. Final papers will be uploaded to your D-portfolio to demonstrate mastery of the topics. The professors will assign the themes of this final project. If you want to switch projects, it is your responsibility to contact other members of the class and to swap topics.

The outline must include the following sections:

1. Introduction
2. Genetics
3. Mutations
4. Subcellular Organelles
5. AP
6. Neurotransmitters
7. NT release
8. Ion Channels
9. Current advancements
10. Conclusion

Each of the 10 sections in the outline must contain 5 bullet points with information you are going to include in the final paper. Sections 2-8 can be rearranged in a different order if that makes more sense for your topic.

Grading Rubric for Outline:

Section	0 points	1 point	2 points
Introduction	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
Genetics	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
Mutations	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
Subcellular Organelles	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
AP	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
Neurotransmitters	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
NT Release	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
Ion Channels	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
Current Advancements	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information
Conclusion	Bullet points do not demonstrate mastery of the material and organizing necessary information	Bullet points demonstrate some mastery of the material and some organization of the necessary information	Bullet points demonstrate mastery of the material and organization of the necessary information

Final Project Draft Review:

You will load a draft of your final project for peer review. After you upload it, Canvas will assign peer-reviewers to offer feedback. The professors will monitor the assignment to ensure everyone has posted thoughtful, constructive reviews with advice on improvement. Once all reviews are posted, grades for uploading the draft will be assigned.

Final Project Expectations:

Each of the listed topics/concepts should be covered in your paper. Knowledge of each topic should be demonstrated in your writing. Each topic should be fully explained as to how it relates to your theme. It is expected that your document will be well written and well

organized. Therefore, critical attention must be given to transitions from one topic/concept to another, word choices, grammar, formatting and spelling. Be sure to properly cite any literature used to construct your document in the formatting style for review papers in the Journal of Neuroscience. This will be submitted to Canvas as a Word Doc. You cannot use textbook or website citations, only review articles and primary literature. Word count is 2750 words - 3250 words. The word count must be on the title page. Please be sure to arrange time with the Professors and/or the CWS tutors to assist with this document.

Final Project Grading Rubric:

Introduction	Paper lacks a sufficient introduction to the topics and shows no mastery of the material.	Paper has some introduction, but not properly integrated. Some mastery of the information is evident.	Paper has most of the material for the introduction and is mostly integrated. Mastery of the material is mostly present.	Paper has an introduction that contains sufficient material that is properly integrated. Mastery of the information is evident.
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Genetics	Section does not contain appropriate knowledge or integration to the theme. No mastery of the subject is evident.	Section has some knowledge of the topic and some integration to the theme. Some mastery of the information is evident.	Section contains most of the knowledge for the topic and most of the integration of the them. Mastery of the material is mostly present.	Section contains necessary knowledge and integration of knowledge to the theme. Mastery of the information is evident,
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Mutations	Section does not contain appropriate knowledge or integration to the theme. No mastery of the subject is evident.	Section has some knowledge of the topic and some integration to the theme. Some mastery of the information is evident.	Section contains most of the knowledge for the topic and most of the integration of the them. Mastery of the material is mostly present.	Section contains necessary knowledge and integration of knowledge to the theme. Mastery of the information is evident,
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Subcellular Organelles	Section does not contain appropriate knowledge or integration to the theme. No mastery of the subject is evident.	Section has some knowledge of the topic and some integration to the theme. Some mastery of the information is evident.	Section contains most of the knowledge for the topic and most of the integration of the them. Mastery of the material is mostly present.	Section contains necessary knowledge and integration of knowledge to the theme. Mastery of the information is evident,
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Action Potential	Section does not contain appropriate knowledge or integration to the theme. No mastery of the subject is evident.	Section has some knowledge of the topic and some integration to the theme. Some mastery of the information is evident.	Section contains most of the knowledge for the topic and most of the integration of the them. Mastery of the material is mostly present.	Section contains necessary knowledge and integration of knowledge to the theme. Mastery of the information is evident,
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Neurotransmitters	Section does not contain appropriate knowledge or integration to the theme. No mastery of the subject is evident.	Section has some knowledge of the topic and some integration to the theme. Some mastery of the information is evident.	Section contains most of the knowledge for the topic and most of the integration of the them. Mastery of the material is mostly present.	Section contains necessary knowledge and integration of knowledge to the theme. Mastery of the information is evident,
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
NT release	Section does not contain appropriate knowledge or integration to the theme. No mastery of the subject is evident.	Section has some knowledge of the topic and some integration to the theme. Some	Section contains most of the knowledge for the topic and most of the integration of the them.	Section contains necessary knowledge and integration of knowledge to the theme.

		mastery of the information is evident.	Mastery of the material is mostly present.	Mastery of the information is evident,
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Ion Channels	Section does not contain appropriate knowledge or integration to the theme. No mastery of the subject is evident.	Section has some knowledge of the topic and some integration to the theme. Some mastery of the information is evident.	Section contains most of the knowledge for the topic and most of the integration of the them. Mastery of the material is mostly present.	Section contains necessary knowledge and integration of knowledge to the theme. Mastery of the information is evident,
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Current Advancements	Section does not contain appropriate knowledge or integration to the theme. No mastery of the subject is evident.	Section has some knowledge of the topic and some integration to the theme. Some mastery of the information is evident.	Section contains most of the knowledge for the topic and most of the integration of the them. Mastery of the material is mostly present.	Section contains necessary knowledge and integration of knowledge to the theme. Mastery of the information is evident,
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Conclusions	Paper lacks a sufficient conclusion to the topics and shows no mastery of the material.	Paper has some conclusion, but not properly integrated. Some mastery of the material is evident.	Paper has most of the conclusion necessary and it is mostly integrated. Mastery of the material is mostly present.	Paper has a conclusion that contains sufficient material that is properly integrated. Mastery of the material is evident.
	<i>0points</i>	<i>2points</i>	<i>5points</i>	<i>7points</i>
Grammar/Spelling	Poor Grammar and spelling.	Some Grammar and spelling errors.	Very few grammar and spelling errors	No grammar or spelling errors
	<i>0points</i>	<i>4points</i>	<i>8points</i>	<i>10points</i>
Formatting	Proper formatting was not followed	Proper formatting was followed most of the time	Proper formatting was followed.	
	<i>0points</i>	<i>7points</i>	<i>10points</i>	
Overall Cohesion/Flow of the paper	The paper was choppy and did not flow.	The paper flowed/was cohesive most of the time.	The paper was cohesive.	
	<i>0points</i>	<i>7points</i>	<i>10points</i>	

Course Schedule*:

**The Professors reserve the right to change the schedule as needed*

Date	Class Topic	Reading assignment	Assignment Due BEFORE Class
T 8/18	<i>Pre Test (ONLINE)</i>		
TR 8/20	Syllabus and group agreements - begin draft of CV and personal statement	Syllabus	Syllabus DRQ
T 8/25	1. Neuroscience Techniques and History	Chapter 1 in Purves et. al. and Chapter 7 in Larimore SZ and Epilepsy Articles	DRQ 1
TH 8/27	Mock Presentation by professors/ Epilepsy and Schizophrenia overview	Ross et al (Schizophrenia background) and Stafsform and Carmant 2015 (epilepsy)	Epilepsy and SZ worksheet Quiz #1
T 9/1	2. Anatomy of the Nervous System Part 1	Chapter 1, pages 13 - 16; Appendix A2 - A31 in Purves et. al. and Chapter 1 in Larimore	DRQ 2
TH 9/3	Student Article Presentations #1 - Technique and Article Discussions	Zhang 2012	AA1 Quiz #2
T 9/8	3. Anatomy of the Nervous System Part 2	Chapter 1, pages 13 - 16; Appendix A2 - A31 in Purves et. al. and Chapter 1 in Larimore	DRQ 3
TH 9/10	Student Article Presentations #2 - Technique and Article Discussions	Mullin 2011	AA2 Quiz #3
T 9/15	4. Types of Cells	Chapter 1 pages 1-10 in Purves et. l, Chapter 2 in Larimore and Derecki 2012	DRQ 4
TH 9/17	Student Article Presentations #3 - Technique and Article Discussions	Newell-Litwa 2010	AA3 Quiz #4
T 9/22	5. Cytology of a Neuron	Chapter 1 pages 5-7; CH5 pages 85-88,99; CH 7 pages 160-161 in Purves et. al. , and Horton 2005	DRQ 5
W 9/23	Outline of the final project due online		
TH 9/24	Student Article Presentations #4 - Technique and Article Discussion	Ammann 2016	AA4 Quiz #5
T 9/29	6. Development	Chapter 22 in Purves et. al. and Chapter 1 in Larimore and Lui Ng 2018	DRQ 6
TH 10/1	Student Article Presentations #5 - Technique and Article Discussion - Design an Experiment in class activity	Collins and Keshavan 2018	AA5 Quiz #6
F 10/2	<i>Final project rough draft due online</i>		
M 10/5	Test # 1 Online	Test # 1 Online	
T 10/6	Manuscript Review day	Manuscript Review day	
<u>TH 10/8</u>	<u>NO CLASS : FALL BREAK</u>	<u>NO CLASS : FALL BREAK</u>	
T 10/13	7. Membrane Potential	Chapter 2 in Purves et. al. and Chapter 5 in Larimore	DRQ 7
TH 10/15	Student Article Presentations #6 - Technique and Article Discussions - Design an Experiment in class activity	Jentsch 2009	AA6 Quiz #7
T 10/20	8. Ion Channels	Chapter 3 in Purves et. al.	DRQ 8
TH 10/22	Student Article Presentations #7 - Technique and Article Discussion - Design an Experiment in class activity	Orozco 2014	AA7 Quiz #8
F 10/23	CV and Personal Statement Due - In order for you to receive a grade, you will have to edit classmate's drafts of CV and Personal Statements	CV and Personal Statement PDFs on Canvas	CV and Personal statement
T 10/27	9. The Action Potential	Chapter 4 in Purves et. al. and Chapter 3 in Larimore	DRQ 9 & Outline

TH 10/29	Student Article Presentations #8 - Technique and Article Discussion - Design an Experiment in class activity	Spiegel 2015	AA8 Quiz #9
T 11/3	10. Transmitter Release	Chapter 5 in Purves et. al. and Harata 2006	DRQ 10
TH 11/5	Student Article Presentations #9 - Technique and Article Discussion - Design an Experiment in class activity	Karlsgodt 2011	AA9 Quiz #10
T 11/10	11. Neurotransmitters and Second Messenger systems	Chapter 6 and 7 in Purves et. al. and Chapter 4 in Larimore and Gaol and Penz 2015	DRQ 11
TH 11/112	Student Article Presentations #10 - Technique and Article Discussion - Design an Experiment in class activity	Bhardwaj 2015	AA10 Quiz #11
T 11/17	12. Synaptic Plasticity	Chapter 8 in Purves et. al.	DRQ 12
TH 11/19	Student Article Presentations #11 - Technique and Article Discussion - Design an Experiment in class activity	Takao et al 2008	AA11 Quiz #12
F 11/20	Final Project due at 5PM	Final Project Due	
M 11/23	Test #2 Online	Test #2 Online	
11/24	Student Article Presentations #12 - Technique and Article Discussion - Design an Experiment in class activity	Lee 2018	AA12
<u>11/26</u>	<u>No Class - Thanksgiving Break</u>	<u>No Class - Thanksgiving Break</u>	
Wed Dec 2 - Mon Dec 7	Post-Test Online		

BIO 350 Laboratory – 1 Credit Course

Course Overview:

This laboratory is designed as inquiry- based. Therefore, students will design their experiment, carry out that experiment, analyze the data, and communicate their findings through a lab report and an oral presentation.

Students will be broken into small teams, similar to teams that are part of research labs. The first few lab classes will function to introduce our model species, the crayfish and the techniques that are available. Each group will be responsible for identifying a hypothesis that can be tested with the techniques and materials that will be used. To do this, an examination of primary literature will be necessary, so please bring a tablet or laptop to class or share with a friend throughout the duration of the course.

Ethical Treatment of Animals:

As a scientist you are to respect the organism that you are studying. It is important that the crayfish are never left without food, enrichment and that their environmental conditions are adequate. Students will be assigned a schedule for care and maintenance of the animals. This includes making sure they have sufficient food, removing waste or dead animals, and turning off the lights. These factors are important as alterations can impact the quality of data generated. Failure to do so will result in an automatic 0 in the laboratory section of the course.

Lab Notebook: A lab notebook is a legal and official record of all things that occur in your experiment and in your workings in the lab. A lab notebook is a composition notebook with numbered pages, in which for each experimental or lab day the methods used, the observations made, and the results obtained are recorded in consecutive order. All handwritten text should be in blue or black ink and legible. If you make a mistake that's okay, simply put one line through the text and place your initials next to this omission (you should still be able to read the crossed-out text). Text is often supplemented by properly labeled diagrams, graphs, or pictures of the obtained results. If these items are printouts make sure they are attached securely to your notebook and contain references as to where to obtain and view the original file. In a research setting your lab notebook is property of the lab and likely will be used by future scientists, who may want to replicate what you have done. In this course we will randomly collect and grade your lab notebook, so ensure that your notebook is up to date, legible and provides a clear picture of your lab activities.

Lab Report: When a scientist writes up their results to publish in a journal, they have to follow that journal's style of manuscripts. We will practice that in this class. Your paper must follow the specifications for submission to Journal of Neuroscience for each section and for the references. Focus on the section labeled: Preparing a manuscript submission for review: <http://www.jneurosci.org/content/preparing-manuscript#organization>

Your lab report will contain the following elements:

1. Abstract: A brief summary

- A. with 2-3 sentences of background information, including the lack of knowledge in the field that this will research will address

- B. the hypothesis
- C. 1 general sentence of the methods used
- D. 1-2 sentences of the results summarized
- E. 1-2 sentences about the importance of the results

2. Introduction: In this section you will need to do the following:

- A. Give the background information that is necessary to understand the results section
- B. Describe what is unknown about the field of study we are exploring and why these studies are important
- C. Give your hypothesis

3. Materials and Methods: In this section you will need to do the following:

- A. Describe the materials used for the experiments, even if it was an experiment conducted by the instructor.
- B. Describe the methods used for the experiments, even if it was an experiment conducted by the instructor.

4. Results (NOT JUST THE FIGURES AND FIGURE LEGENDS - IT IS MORE THAN THAT!!): In This section you will need to address the following:

- A. Include your figures
- B. Describe the following for each figure:
 - a. In a few words, what method did you use to generate the figure?
 - b. In a sentence or 2, describe the goal of the experiment.
 - c. Describe your findings
 - d. Do these findings support your hypothesis or not?

5. Conclusion: In this section you will need to do the following:

- A. Recap the main findings from the experiments
- B. State if all the findings support your hypothesis
- C. Discuss how these findings impact the field of study –why are they important
- D. Suggest a natural next step from these experiments.

Lab Report Sections: Throughout the semester, different sections for your lab report will be due (please see schedule below for exact dates). Each section will be critiqued by your peers and the Professors. During this exercise, each section will be worth 5 points. If instructions/comments are not incorporated into the final document, points will be deducted.

These are to be submitted on Canvas as a word doc with your last name as part of the file name. Before they are turned in, setup a meeting with a tutor at the CWS. Get a slip from the CWS saying they reviewed your section, take a picture of that slip and attach it to the bottom of word doc. Failure to follow these instructions will result in loss of points.

Laboratory Report Sections Review Rubric:

5 points	3.5 points	2 points	1 point	0 points
The section is proper length. Highly informative, complete and easy to understand. Appropriate vocabulary is used. Had a tutor from the CWS proof-read your review and you incorporated the changes.	The section is proper length. Informative, complete and understandable. Appropriate vocabulary is used. Had a tutor from the CWS proof-read your review and you incorporated the changes.	The section is proper length. Somewhat informative and understandable. Had a tutor from the CWS proof-read your review and you incorporated some of the changes.	Not very informative or understandable. Had a tutor from the CWS proof-read your review and did not make any changes.	Not very informative or understandable. Did not go to the CWS.

Lab Report Final Document:

At the end of the semester, you will write a lab report with a well-sourced introduction (8 sources at minimum), a materials and methods section, a results section explaining the data you obtained in lab (DO NOT SIMPLY PUT THE CAPTIONS FOR THE FIGURES), and a well-sourced discussion section (4 sources minimum). The majority of your references should be primary literature. You will be graded on appropriate use of scientific terminology, on construction of your report (it's overall structure), and the amount of information/appropriate information you include in your report. Follow the author guidelines for the Journal of Neuroscience to determine the structure for each of the sections of this report. Pay close attention to the order of the sections as well as the citation style.

Formatting - JNEURO guidelines	<table border="1"> <tr> <td data-bbox="537 533 808 646"> Formatting was not followed 0 points </td> <td data-bbox="808 533 1105 646"> Formatting was somewhat followed 2.5 points </td> <td colspan="3" data-bbox="1105 533 1529 646"> Formatting was followed 5 points </td> </tr> </table>					Formatting was not followed 0 points	Formatting was somewhat followed 2.5 points	Formatting was followed 5 points			
Formatting was not followed 0 points	Formatting was somewhat followed 2.5 points	Formatting was followed 5 points									
Abstract - background info, knowledge gap, hypothesis and result summary	<table border="1"> <tr> <td data-bbox="537 695 716 846"> Contains no pieces of the abstract 0 points </td> <td data-bbox="716 695 894 846"> Contains one or two pieces of the abstract. 2 points </td> <td data-bbox="894 695 1073 846"> Contains some of the pieces of the abstract 3 points </td> <td data-bbox="1073 695 1252 846"> Contains most of the pieces of the abstract 4 points </td> <td colspan="2" data-bbox="1252 695 1529 846"> contains all the pieces of the abstract 5 points </td> </tr> </table>					Contains no pieces of the abstract 0 points	Contains one or two pieces of the abstract. 2 points	Contains some of the pieces of the abstract 3 points	Contains most of the pieces of the abstract 4 points	contains all the pieces of the abstract 5 points	
Contains no pieces of the abstract 0 points	Contains one or two pieces of the abstract. 2 points	Contains some of the pieces of the abstract 3 points	Contains most of the pieces of the abstract 4 points	contains all the pieces of the abstract 5 points							
Introduction - Include background info, the unknown, and the hypothesis	<table border="1"> <tr> <td data-bbox="537 894 716 1073"> does not contain pieces of the intro section 0 points </td> <td data-bbox="716 894 894 1073"> contains only 1-2 pieces of the intro section 5 points </td> <td data-bbox="894 894 1073 1073"> contains some of the pieces of the intro section 10 points </td> <td data-bbox="1073 894 1252 1073"> contains most of the pieces of the intro section 15 points </td> <td colspan="2" data-bbox="1252 894 1529 1073"> contains all the pieces of the intro section 20 points </td> </tr> </table>					does not contain pieces of the intro section 0 points	contains only 1-2 pieces of the intro section 5 points	contains some of the pieces of the intro section 10 points	contains most of the pieces of the intro section 15 points	contains all the pieces of the intro section 20 points	
does not contain pieces of the intro section 0 points	contains only 1-2 pieces of the intro section 5 points	contains some of the pieces of the intro section 10 points	contains most of the pieces of the intro section 15 points	contains all the pieces of the intro section 20 points							
Results - For each data set you need 1. a well labeled figure 2. a paragraph for each figure describing the method, the findings, the goal of the experiment, and if the hypothesis is supported.	<table border="1"> <tr> <td data-bbox="537 1121 716 1302"> does not contain pieces of the results section 0 points </td> <td data-bbox="716 1121 894 1302"> contains only 1-2 pieces of the results section 5 points </td> <td data-bbox="894 1121 1073 1302"> contains some of the pieces of the results section 10 points </td> <td data-bbox="1073 1121 1252 1302"> contains most of the pieces of the results section 15 points </td> <td colspan="2" data-bbox="1252 1121 1529 1302"> contains all the pieces of the results section 20 points </td> </tr> </table>					does not contain pieces of the results section 0 points	contains only 1-2 pieces of the results section 5 points	contains some of the pieces of the results section 10 points	contains most of the pieces of the results section 15 points	contains all the pieces of the results section 20 points	
does not contain pieces of the results section 0 points	contains only 1-2 pieces of the results section 5 points	contains some of the pieces of the results section 10 points	contains most of the pieces of the results section 15 points	contains all the pieces of the results section 20 points							
Conclusion - Recap main findings, how they tie to the hypothesis, how the findings impact the field (why they are important). and suggest next studies	<table border="1"> <tr> <td data-bbox="537 1350 716 1598"> little to no explanation of the pieces and not all the information is present. 0 points </td> <td data-bbox="716 1350 894 1598"> pieces are missing and not well explained 5 points </td> <td data-bbox="894 1350 1073 1598"> some of the conclusion is clear but pieces are left out 10 points </td> <td data-bbox="1073 1350 1252 1598"> Most pieces of the conclusion are clear and explained 15 points </td> <td colspan="2" data-bbox="1252 1350 1529 1598"> all pieces of the conclusion are clear and well explained 20 points </td> </tr> </table>					little to no explanation of the pieces and not all the information is present. 0 points	pieces are missing and not well explained 5 points	some of the conclusion is clear but pieces are left out 10 points	Most pieces of the conclusion are clear and explained 15 points	all pieces of the conclusion are clear and well explained 20 points	
little to no explanation of the pieces and not all the information is present. 0 points	pieces are missing and not well explained 5 points	some of the conclusion is clear but pieces are left out 10 points	Most pieces of the conclusion are clear and explained 15 points	all pieces of the conclusion are clear and well explained 20 points							
Materials and Methods - Give the materials and methods used for ALL experiments	<table border="1"> <tr> <td data-bbox="537 1646 716 1827"> No real methods or materials described 0 points </td> <td data-bbox="716 1646 894 1827"> Materials or methods left out 4 points </td> <td data-bbox="894 1646 1073 1827"> Contains some of the pieces of the M&M 6 points </td> <td data-bbox="1073 1646 1252 1827"> Contains most of the pieces of the M&M 8 points </td> <td colspan="2" data-bbox="1252 1646 1529 1827"> contains all the pieces of the M&M 10 points </td> </tr> </table>					No real methods or materials described 0 points	Materials or methods left out 4 points	Contains some of the pieces of the M&M 6 points	Contains most of the pieces of the M&M 8 points	contains all the pieces of the M&M 10 points	
No real methods or materials described 0 points	Materials or methods left out 4 points	Contains some of the pieces of the M&M 6 points	Contains most of the pieces of the M&M 8 points	contains all the pieces of the M&M 10 points							
CWS Proofread?	<table border="1"> <tr> <td colspan="3" data-bbox="537 1831 976 1906"> CWS reviewed the final draft 10 points </td> <td colspan="3" data-bbox="976 1831 1529 1906"> CWS did not review the final 0 points </td> </tr> </table>					CWS reviewed the final draft 10 points			CWS did not review the final 0 points		
CWS reviewed the final draft 10 points			CWS did not review the final 0 points								

Pre-labs: When applicable, at the start of lab you will complete a short quiz regarding the assigned readings of the day. Each is worth 5 points and can not be made up.

Lab Poster Presentation: In addition to a written report, at the end of the semester you will present your work.

Poster Grading Rubric:

Criteria	5: Excellent	4: Good	2-3: Fair	1-2: Poor
1. Organization (5)	<ul style="list-style-type: none"> • Clear title • Clearly defined sections • Clear flow of topics • Easy to follow 	<ul style="list-style-type: none"> • Clear title • Sections defined • Generally easy to follow, though may require rereading for clarity 	<ul style="list-style-type: none"> • Title present • Sections unclear or inappropriate • Takes effort to follow thoughts and ideas 	<ul style="list-style-type: none"> • Title unclear or absent • Sections unclear or absent • No flow of ideas • Cluttered, messy
2. Creativity (5)	<ul style="list-style-type: none"> • eye-catching • Diagrams clearly labeled • Good balance of text and graphs or pictures • Engaging use of color 	<ul style="list-style-type: none"> • Neat • Some use of color • Diagrams present • Fair balance of text and graphs or pictures 	<ul style="list-style-type: none"> • Bland • Little or no color • Diagrams absent or unclear • Mainly or all text 	<ul style="list-style-type: none"> • Bland • Boring • No variety in layout • Diagrams absent • Majority is text
3. Science Content (5)	<ul style="list-style-type: none"> • contains all the necessary information to understand the project • Information is explained in a very understandable fashion • No excess information that is distracting • All abbreviations are defined 	<ul style="list-style-type: none"> • contains most of the information necessary to understand the project • Information is explained in a pretty understandable fashion • The majority of the information is not distracting • Most abbreviations are defined 	<ul style="list-style-type: none"> • contains some of the information necessary to understand the project • Information is poorly explained • Excess information is distracting • Some abbreviations are defined 	<ul style="list-style-type: none"> • contains little to no information necessary to understand the project • Information is not explained • Excess information is distracting • abbreviations are not defined
4. Oral presentation (5)	<ul style="list-style-type: none"> • Well-rehearsed without long pauses • clear articulation • appropriate eye contact, voice volume 	<ul style="list-style-type: none"> • Well-rehearsed with some pauses • Articulation, eye contact, voice volume generally adequate 	<ul style="list-style-type: none"> • Obvious lack of rehearsal • Lacking in one of areas: articulation, eye contact, voice volume 	<ul style="list-style-type: none"> • Obvious lack of rehearsal • lack of conveyed information • lacking in one <u>ore</u> more of the following areas: articulation, eye contact, voice volume

Laboratory Course Schedule*:

*These dates/plans are tentative.

Dates	Laboratory Topic	Laboratory Task	Assignments <i>All readings should be completed prior to lab</i>
Lab 1 9/8 or 9/9	Introduction to Lab & Crayfish	Watch Video (prior to class) Group discussion Project discussion	Ambrose et al - Chapter 2 "Asking Questions and Formulating Hypotheses" <i>Pre- lab 1 due</i>
Lab 2 9/15 or 9/16	Introduction to Crayfish Anatomy	Watch Dissection videos and answer questions Project discussion	Ambrose et al - Chapter 3 "Kinds of Data and Scales of Measurement" <i>Pre-lab 2 due</i>
Lab 3 9/22 or 9/23	Crayfish Behavior	Watch videos of crayfish behavior and analyze data	Ambrose et al - Chapter 6 "The Experimental Plan" <i>Pre- lab 3 due</i>
Lab 4 9/29 or 9/30	Develop Experimental Hypothesis	Review Literature types/ citations and complete citation assignment, present problem, spend time in class working on abstract	Ambrose et al - Chapter 9 "Using the Library" and Chapter 10 "An Introduction to Biological Literature" <i>Experimental design & hypothesis to the professor</i> <i>Pre- lab 4 due</i>
Lab 5 10/13 or 10/14	Experimental design	Discuss Abstract feedback, start to discuss the lab report, & experiments	Ambrose et al - Chapter 11 "How to write a scientific paper" and Chapter 13 "Problems and Pitfalls in Writing a Scientific Paper" <i>Revised experimental design due to the professor</i> <i>Pre- lab 5 due</i>
Lab 6 10/20 or 10/21	Writing Days	Professor conduct experiments	<i>Introduction due to the professor</i>
Lab 7 10/27 or 10/28	Data Analysis	Introductions feedback Score videos	Ambrose et al - Chapter 8 "Statistical Test" <i>Method section due</i> <i>Pre- lab 6 due</i>
Lab 8 11/3 or 11/4	Statistics & Results Group Work on Poster Presentations	Scoring and Data analysis	Ambrose et al - Chapter 12 "Illustrating Data in Tables and Figures" <i>Results section due</i> <i>Pre- lab 7 due</i>
Lab 9 11/10 or 11/11	CV Discussion	In class time to work on poster and manuscript	Ambrose et al - Chapter 14 "Preparing and Delivering Oral Presentations" <i>Discussion section due</i> <i>CV draft due</i> <i>Pre- lab 8 due</i>
Lab 10 11/17	Poster presentations and final paper comments <i>Final paper due 11/24/2020</i>		

