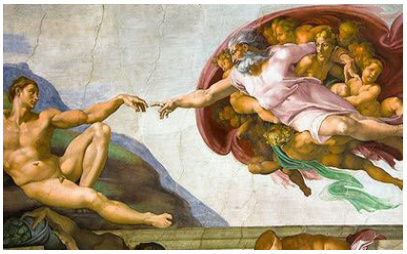
BIOLOGY 360 NEUROBIOLOGY SYLLABUS FALL 2023



COURSE DESCRIPTION

Understanding the detailed workings of the brain is the goal of neuroscience. Neuroscience is a vast, rapidly evolving, and incredibly exciting subject ranging from elucidating neuronal function at the molecular and cellular levels to providing mechanistic explanations of higher-level cognitive function. The goals of this course are: 1) to provide an underpinning of basic neuroscience principles, and 2) to prepare students for 400 level neuroscience courses at the University of Oregon. The course is divided into two parts: the first part focuses on the cellular and molecular mechanisms and principles responsible for proper neuronal function at the level of a single nerve cell. The second half of the course surveys a variety of topics at the sensory and motor systems, cognitive and medical neuroscience levels.

INSTRUCTORS (For office hours, see Section VIII or **INSTRUCTORS** on CANVAS homepage)

Nathan Tublitz (tublitz@uoregon.edu; office hours by appointment)
Molly Shallow (mshallow@uoregon.edu; office hours: Tues 12-30-2:30 PM, LISB 2nd fl. atrium)
Rocky Penick (rpenick@uoregon.edu (they, them, theirs); office hours: Wed 11:00 AM-1:00 PM; Straub 258)

COURSE WEBSITE: https://canvas.uoregon.edu/courses/225665

COURSE OVERVIEW

The course has numerous, diverse elements, all of which will assist you in understanding the course content and performing well. Details of each are described below (syllabus page #). and are also found on **CANVAS**.

COURSE DETAILS

I. LECTURES

Lectures will be held on Tuesdays and Thursdays at 10:00 AM in 229 McKenzie Hall. Lectures will be 80 minutes long with PowerPoint slides. You are warmly encouraged to ask questions throughout the lecture.

II. LECTURE PDFs

To assist in your understanding of the course, PDFs of the PowerPoint slides for each lecture will be posted **here** on Canvas shortly before each lecture.

III. LECTURE, ASSIGNMENTS & READINGS SCHEDULE

LECTURE # & DATE Papers & Exams Survey	TOPIC	READINGS (K, Kandel; L, Liu; NO, Neuroscience Online; numbers refer to chapters)
WEEK 1		
1) 26 Sept **Pre-Course Survey**	**HOUSEKEEPING & INTRODUCTION**	K, 1-3; L, 1; NO, Intro & 1.1
2) 28 Sept	**RESTING POTENTIAL**	K, 9; L, 2; NO, Intro & 1.1
WEEK 2		
3) 03 Oct	**ACTION POTENTIALS**	K, 10; L, 2; NO, 1.1-3
4) 05 Oct	**CHANNELS**	K, 8; L, 2; NO, 1.1-2
WEEK 3		
5) 10 Oct	**PASSIVE PROPERTIES OF NEURONS**	K, 9; L, 2; NO, 1.3
6) 12 Oct **PAPER #1: due 10:00 AM**	**SYNAPSES I**	K, 11; L, 3; NO, 1.4
WEEK 4		
7) 17 Oct	**SYNAPSES II**	K, 12,13 & 15; L, 3; NO,1.5
8) 19 Oct	**SYNAPSES III**	K, 12, 13 & 15; L, 3; NO, 1.6
WEEK 5		
9) 24 Oct	**TRANSMITTERS**	K, 16; L, 3; NO, 1.11-14
10) 26 Oct **EXAM #1 (in class)**	**NO LECTURE – EXAM #1**	n/a
WEEK 6		
11) 31 Oct	**SENSORY SYSTEMS I**	K, 17 & 29; L, 6; NO, 2.9
12) 02 Nov	**SENSORY SYSTEMS II**	K, 17 & 29; L, 6; NO, 2.9
WEEK 7		
13) 07 Nov	**CONTROL OF MOTOR PATTERNS I**	K, 30-33; L, 8; NO, 3.1-3
14) 09 Nov	**CONTROL OF MOTOR PATTERNS II**	K, 30-33; L, 8; NO, 3:1-3
WEEK 8		
15) 14 Nov	**NEURONAL PLASTICITY I**	K, 52-54; L, 11; NO, 1.7 & 4.7
16) 16 Nov **PAPER #2: due 10:00 AM**	**NEURONAL PLASTICITY II**	K, 52-54; L, 11; NO, 1.7 & 4.7
WEEK 9		
17) 21 Nov	**DISEASES OF THE NERVOUS SYSTEM**	K, 54-60; L, 12; NO, 4.10
18) 23 Nov	**NO LECTURE (Thanksgiving)**	
WEEK 10		
19) 28 Nov	**DRUGS, ADDICTION & THE DOPAMINE REWARD CENTER**	PAPER: **The Neuroscience of Drug Reward & Addiction**
20) 30 Nov **EXAM #2 (take home; due Sunday 03 Dec 12:00 PM)**	**THIS IS JUST THE BEGINNING**	PAPER: **Right vs Left Brain** PAPER: **The Next 50 Years of Neuroscience**

IV. SUPPLEMENTAL VIDEOS

Each lecture includes two or more short videos and several others not shown in class. These videos, posted **here**, are optional, however you are urged to watch them as they will enhance your understanding of the lecture materials.

V. TEXTBOOKS

There is no official textbook for the course. To understand the course material, however, it is essential to read a neuroscience textbook of your choice. Nearly every neuroscience text covers the basic material in this course. Here are two of the best in print, an excellent online text, and a special book to read:

A. ***Principles of Neural Science***, Kandel, Koester, Mack & Siegelbaum (K), 6th Edition, Elsevier (2021). Lucidly written, very comprehensive and expensive neurobiology textbook with more clinical coverage than other texts. Recommended for those wanting a first-rate, wide-ranging neuroscience reference source.

B. ***Principles of Neurobiology***, Luo (L), 2nd edition, Garland (2021). Presents the major concepts of neuroscience. The text is organized around a series of key experiments to illustrate how scientific progress is made. Concise and well written.

C. ***Neuroscience Online*** (NO), **https://nba.uth.tmc.edu/neuroscience**, U. Texas Health Sciences Center Neuroscience faculty. An excellent, clearly written of basic neuroscience topics. Online and free!

D. ***The Man Who Mistook His Wife for A Hat***, Sacks, Harper and Row (1985). **REQUIRED READING.** This inexpensive paperback provides a very different view of neuroscience. The content of the Sacks book does not correlate with that of the lecture schedule; hence you are responsible for chapters 1-12 for Exam #1 and the rest for Exam #2.

VI. WEEKLY DISCUSSION SECTIONS & SCHEDULE

The purpose of these weekly meetings is two-fold: 1) to augment your understanding of the lecture material by discussing and answering a set of discussion questions derived from the week's lectures (posted **here**); and, 2) to address whatever questions have arisen during lectures. Answers to the discussion section questions will be posted on CANVAS after the discussion sections. Discussion section attendance is voluntary but highly recommended. Feel free to drop in on one of the other discussion sections if you can't make yours.

DISCUSSION SECTIONS SCHEDULE (Fridays, 204 Tykeson; 10:00-10:50 AM, 11:00-11:50 AM & 12:00-12:50 PM)

Weeks 1-8: Discussion sections will be held

Weeks 9 & 10: No discussions (Thanksgiving and take-home exam in progress)

VII. ASSIGNMENTS: EXAMS & PAPERS

A. ASSIGNMENTS. There are 4 assignments: 2 exams and 2 papers. Each assignment will be worth 25% of your final course grade. Grading scales and the course grading policy are found in Section XIII (p. 8) of this document.

B. EXAMS. There are two exams in this course, an in-class midterm and a take-home final. Exam answers and grade distributions as well as previous Bi 360 exams will be posted **here**. HINT: Try the old exams without answers first before viewing the answers. **There are no make-up exams. A missed exam will be graded an "F" unless arrangements are made in advance of the scheduled exam.**

1. **Exam #1 (midterm; Thursday 26 Oct)**. This closed book, closed notes exam will be held in class and will consist of 10-15 short answer questions.

2. **Exam #2 (take-home final; available on CANVAS on Thursday 30 Nov at 12 noon and must be uploaded onto the Exam #2 (points; upload exam here) page no later than Sunday 03 Dec at 12 noon)**. The only acceptable formats are docx, doc, rtf, txt and pdf formats. **Late exams will not be graded and will receive an "F"**.

This exam is a 72 hr, open book, open notes exam. You may use the internet as a resource but you may not use any AI program. The exam is cumulative, covering the entire course.

The exam consists of 12 questions of which you are allowed to answer only 10 of your choice. If you answer more than 10, only the first 10 will be graded.

Your **typed**, single spaced answers should be entered into the document using a typical font like Times New Roman and no smaller than 12 pt. Each answer should not exceed one page including the question. Each question should begin at the top of a new page. Any figures/graphs /charts must be inserted into the exam and be part of the page limit.

If you have questions about the exam, please contact Nathan by email or WhatsApp. Your questions will be answered as quickly as possible. Please note that Nathan will not respond to messages between 11 PM and 8 AM and will be unavailable after 12 noon Saturday Dec 2nd.

You must not work with or discuss the exam questions or answers with anyone, you must adhere to the **University Student Conduct Code**, and you are forbidden from using any AI program to generate answers. Violations will be subject to sanctions.

This test will be graded only if the following statement is electronically signed (typing in your full name is sufficient to demonstrate affirmation):

> *"On my honor, I did not collaborate with any other person, including a fellow student, during this exam. I also declare I did not plagiarize from any source, I did not use AI programs, and that I did not violate the University Student Conduct code."*

C. PAPERS. There are two written papers, hard copies submitted in class. Details are found below.
Due dates: Paper #1: Thurs 12 Oct 10:00 AM
Paper #2: Thursday 16 Nov 10:00 AM

Grading of each paper will be based on the insightfulness, quality and depth of your discussion and the clarity of your writing (100 points maximum). Points will be taken off for superficial analyses and/or poor/imprecise writing. **A late paper or one longer than the 3 page maximum will have 10 points deduced from its score.**

1. PAPER #1: REPORT ON A PRIMARY SCIENTIFIC PAPER (DUE IN CLASS Thursday 12 Oct at 10:00 AM; 3 double spaced pages maximum excluding optional references and paper title page and abstract; typed; 12 pt font; 100 pts maximum). A prerequisite to be a biologist of any sort, and even a physician, is the ability to read and critically evaluate the primary scientific literature. The goal of this paper is to help develop these essential skills.

Your assignment is to read and write a short report on a **primary** scientific neuroscience paper **published in 2018 or later *(N.B.*, 5 points will be deducted if older)**. The key word here is **"primary"**; you must read and report on an experimental paper written by those who performed the work rather than a review of that work. A good rule of thumb is that if the paper has a

Materials and Methods section, then it almost certainly is a primary scientific paper. Papers can be on any neurobiological topic from any primary journal. You may choose a paper from a recent neuroscience journal such as *Journal of Neuroscience, Journal of Neurobiology, Neuron, Journal of Neurophysiology,* and *Neuron.* Other journals with neuroscience papers may also be used (*e.g.*, *Journal of Experimental Biology*). *Nature* and *Science* are also excellent sources of interesting neurobiology papers. Review articles are not acceptable. If you are unsure about the paper you have chosen, check with Nathan or the GEs first. You may also find it useful to read other papers related to the one you are reading, usually those cited in the references. **Here** are some notes to assist you in writing Paper #1.

You must specifically and fully answer each of the following questions in order. Please number each answer (points will be deducted if your paper is NOT in this format).

1. What is the paper's full citation (use the format in the reference section of your paper; e.g., author(s), year published, title, journal, volume, page numbers)? Please attach a copy of the title page and abstract (not included in the page limit). (10 points)

2. What is (are) the major scientific issue(s) addressed by the paper? What is (are) the specific experimental hypothesis (hypotheses) posed in the paper? (15 points)

3. What experiments were performed and what methods were used? (please be brief: 10 points)

4. What were the results for each experiment? (20 points)

5. What did the author(s) conclude from the results? Are their conclusions justified? Do you agree with their conclusions? Why or why not? (25 points)

6. Based on these results, what **two** experiments should the researchers do next? (20 points)

2. PAPER #2: REPORT ON AN UNSOLVED NEUROSCIENCE QUESTION (DUE IN CLASS Thursday 16 Nov at 10:00 AM; 3 double spaced pages maximum excluding references and title pages; typed; 12 pt font; 100 points maximum). There are literally hundreds of intriguing neuroscience questions not yet understood. Your goal in this assignment is to identify one unsolved question, explain its importance and propose an experimental test that addresses the question. At least 3 scientific references are required; Wikipedia is not allowed. Some helpful hints for writing this paper are posted **here**.

Your paper must follow the following format (please organize your paper using the following subheadings):

1. Background and Significance (10 points): Make sure the significance of the topic is explicitly stated. Clearly identify the gaps in current knowledge.

2. Main Hypothesis, Experimental Design & Rationale (20 points): Clearly state the hypothesis you are testing. Briefly describe the experimental design of the experiments and explain how the experimental design tests your hypothesis. (*N.B.,* experimental design differs from the methods section. The former describes the approach for testing the hypothesis including controls and number of experimental subjects, whereas the latter focuses on the technical procedural details of the experiment).

3. Methods (15 points): List general approaches first, explaining why the methods you propose are the best available for your questions. Explain what statistical methods you will use and why. Keep this section as brief as possible.

4. Anticipated Results (30 points): Explain how you will analyze the data collected from your experiment. Describe the potential outcomes of your experiments and their likelihood. Explain your interpretation of the different possible results and how they relate to your hypotheses.

5. Potential Problems and Pitfalls (20 points): This section serves as a reality test of your proposed experiment. Be honest; explain pitfalls and problems with your experiments and how alternative approaches will be used if problems occur. All experiments have potential problems and not including these indicates you have not thought carefully about your experiment.

6. References (5 points; not included in the page limit). List all references. Please use full references following the style from any scientific journal.

D. PLAGIARISM & CHEATING ON ASSIGNMENTS. Plagiarism, cheating, and/or collaboration on assignments are unacceptable and will not be tolerated. This includes using AI for any assignment. These behaviors are patently unfair to your fellow classmates who work very hard and honestly for their grades. All Student Conduct Code violations will result in an "F" for that assignment and the student will be reported to the Director of Student Conduct and Community Standards for sanctions. If you have any questions about what constitutes plagiarism or cheating, contact Nathan or the GEs.

VIII. COMMUNICATION WITH YOUR INSTRUCTORS

A. IMMEDIATELY AFTER LECTURE. One of the most effective methods of interaction is to talk with Nathan or the GEs immediately after lecture. This is especially useful when there is a pressing question from lecture not already answered. Don't be shy or bashful – come talk to us!

B. OFFICE HOURS. If you don't have time to meet after class, then drop into our office hours or make an appointment. Office hours for each instructor are as follows:

Nathan: by appointment only
Molly: Tues1, 12-30-2:30 PM, LISB 2nd floor atrium
Rocky: Wed 11:00 AM-1:00 PM, Straub 258

C. PRIVATE MEETINGS WITH NATHAN OR THE GEs. Our goal is to support your learning experience throughout the term. Towards that goal, we are available to meet with you privately during the term to address your issues and/or provide advice and encouragement. These meetings are by appointment only, so please contact us to schedule a meeting.

D. EMAIL. If you prefer the written word, email remains an excellent mode of communication particularly for personal issues. Feel free to communicate with us anytime. We will respond within 24 hours and usually sooner. Please send emails directly to our email addresses rather than using the cumbersome and unreliable CANVAS email system.

E. WHATSAPP WITH NATHAN. WhatsApp is the most used communication tool worldwide and is perfect for voice and video messaging, calls and video chats. Best of all, it is completely free if you are using wifi (it will utilize your data allotment if not connected to wifi). If this type of communication suits you best, download and set up **WhatsApp** on your phone and use it to text or call Nathan with questions. His WhatsApp number is 1-541-913-4510. Here's an easy-to-follow WhatsApp **set up**

guide. One request: the first time you WhatsApp with Nathan, please mention your name and that you are a Bi 360 student.

IX. COMMUNICATION WITH YOUR PEERS

STUDY GROUPS. If you want to be part of a Bi 360 study group this term, use this **Google document** or copy the link below to identify fellow students interested in forming a study group:

https://docs.google.com/document/d/1GCzc10Vsq_ZXvAFipWfic-NEnV3g1FSId73j9ppGuSs/edit?usp=sharing

X. TIPS ON SCIENTIFIC WRITING

Success on the four assignments in the course (2 exams & 2 papers) will depend in large part on the quality of your writing. Strong writing skills are essential in nearly every modern career, and one should always strive to improve one's written expression ability regardless of your current level. To help you strengthen these skills, several excellent and diverse videos have been posted on the course website. The suggestions in these videos, if implemented, will almost certainly have a positive impact on your university career and beyond.

A. ***My Step by Step Guide to Writing a Research Paper (9:14)*.** An excellent, professional review of the steps involved in writing a generic research paper from initial organization to the final product.

B. ***Papers & Essays Crash Course Study Skills (8:59)*.** A zippy, well-produced video on writing a strong paper quickly and efficiently.

C. ***Sainani SciWrite 1.1 (12:34).*** This is the first in a series of videos from a Stanford online scientific writing course. It's an academic presentation to be sure, however, it covers all the major points. If a science career is in your future, you would be well advised to view the entire course (all on YouTube).

D. ***Tips on Scientific Writing(3:56)*.** If you don't have time to view all the Stanford science writing course, try this one from the same presenter. Will immediately improve your editing skills.

E. ***How I Got a First Class in Every Essay at University (19:45)***. How to write a research paper from student's point of view. Covers all the bases. My personal favorite. ("First class" is the equivalent of an "A" in England).

F. *10 Types of Plagiarism*. Self-explanatory. Please read to avoid serious problems in the course.

XI. ADDITIONAL RESOURCES

A. BASIC ELECTRICITY CONCEPTS. This document reviews the major concepts in electricity. Worth a look during the first week of class, particularly for those who have forgotten or never took the electricity part of physics. All major neurobiology textbooks have a basic electricity section, usually as an appendix. We also suggest reading or re-reading the electricity chapter in a physics textbook.

B. NEUROBIOLOGY EQUATIONS. A useful list of the major neurobiology equations covered in the course, each with a brief explanation. Very helpful throughout the course.

XII. PRE-COURSE SURVEY

To help us optimize your learning experience in the course, we ask that you complete a 5 minute, anonymous, pre-course **survey** located on the **quizzes page** on the Bi 360 CANVAS website. The survey is available from Saturday, 23 Sept at 12:00 AM to Friday, 29 Sept at 11:59 PM.

XIII. COURSE GRADING POLICY

A. EXAM GRADING. Each exam will receive a numerical score, which will be converted to a letter grade. Letter grades will be determined using a modified curve, in which the mean score of the class will be assigned a B- and the rest of the grades determined using standard deviation statistics. The curve and a histogram of the scores will be posted on **CANVAS**.

B. WRITTEN ASSIGNMENTS GRADING. The two written assignments will be graded out of a maximum of 100 points and converted to a letter grade using the following conversion scale:

97-100	A+
94-96	A
90-93	A-
87-89	B+
84-86	B
80-83	B-
77-79	C+
74-76	C
70-73	C-
67-69	D+
64-66	D
60-63	D-
<60	F

C. COURSE GRADE CALCULATIONS

1. BASIC CALCULATION. Your course grade will be based on your performance on the four assignments, the two exams and the two written assignments. Each of the four will count as 25% of your course grade. Your course grade will be the mean of the mean of the exam letter grades and the mean of the assignment letter grades. If a mean is in between two letter grades, the higher grade will be used.

2. EXAM WEIGHTING. If your performance on Exam #2 is better than that of Exam #1, then Exam #2 may weigh more when calculating the average of the two exam grades, depending on the amount of improvement. If your Exam #2 grade is lower than that of Exam #1, your exam grade will be the simple average of the two exam grades.

3. ALTERNATIVE GRADING METHOD. If you choose, you may skip Exam #2 and instead write a 5 page paper on any topic in neuroscience (double spaced excluding title and reference pages). The goal is to learn about a new neurobiological topic we did not cover this term. Please use at least 4 primary or reviews as references and use in text citations for all factual statements in the paper. The use of AI in the preparation or writing of this paper is expressly forbidden. **This paper will be due at the same time as Exam #2** (03 Dec at 12 noon; submit to the **Exam #2 points; upload exam here page**). This paper will be graded pass/fail. If you choose this method and receive a passing grade (99.9% pass), your first exam will count for 50% of your course grade with the average of the two written assignments counting for the other 50%. **Papers submitted late or written using AI will receive a failing grade.**

D. IMPORTANT GRADING NOTES

1. There are no make-up exams. A missed exam will be graded an "F" unless arrangements are made in advance of the scheduled exam.
2. A late written assignment or one longer than the 3 page maximum will have 10 pts deduced from its score.

XIV. HINTS FOR SUCCESS

Although this course is an in-person lecture course, much of the learning of the course information takes place outside of lecture. To be successful in this course will require self-motivation, focus, time management, determination, and autonomy (suggestion: watch this excellent **study skills video**). If you work hard and stay on top of the material, this course will help you develop these essential skills and you will do well. One pitfall to avoid is procrastination, an almost certain guarantee of poor performance. Set up an appropriate study schedule now and stick to it throughout the term. Also consider forming small study groups with your fellow students (see COMMUNICATION WITH YOUR PEERS, Section IX, this document). This will not only assist you in learning the course principles and concepts, it will also greatly enhance your overall course experience. If you need assistance finding a study group, we will help you.

An important point: ***Please don't cheat. Take a look at this document, 10 Types of Plagiarism, to help you avoid problems relating to cheating and plagiarism.***

We deeply value your thoughts, suggestions, and advice regarding course improvements throughout the term. Most importantly, your instructors are dedicated to assisting you in learning this fascinating subject. Feel free to contact us for whatever reason.

XV. LEARNING OUTCOMES

By the end of the course, Bi 360 students should be able to:

1. Describe the known cellular and molecular mechanisms responsible for neuronal function at the single neuron level;
2. Explain the basic principles of sensory transduction and processing;
3. Articulate the general concepts underlying motor control;
4. Know the basic cellular and molecular mechanisms underpinning associative and non-associative learning;
5. Understand the symptoms, etiology, and treatment alternatives of several nervous system disorders;
6. Read and comprehend primary and review papers in neuroscience;
7. Develop an understanding of living with a neurological disorder;
8. Identify an unanswered question in neuroscience, develop a testable scientific hypothesis to explore the question, design an experiment to test the hypothesis, and critically evaluate potential outcomes of the experiment;
9. Improve critical thinking and oral and written expression skills, and,
10. Enroll and perform well in 400 level neuroscience courses at the University of Oregon.