NROS 170C1 - 001 Frontiers in Brain Science | The University of Arizona | Fall 2023 | Lecture

Tuesday / Thursday 3:30-4:45, Speech & Hearing Sciences Room 205

Course instructor

Dr. Ulises M. Ricoy
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NOTE: This is a tentative syllabus and Instructor may change the sequence of topics as needed.

Description

The human nervous system is a marvelous piece of biological machinery, from the cellular level all the way up to the behavioral level. Given its accomplishments, there are many reasons why understanding how the brain and nervous system work would be important to us as a species. In understanding the mechanisms of neurological and psychiatric disease we can also add a further sense of urgency to this quest. The aim of this course is to highlight and discuss the intellectual challenges and excitement, as well as the uncertainties surrounding what many call “the last great frontier of biological science.” The information presented in this course will serve as the starting point for students in this class to gain an understanding as to how the human nervous system operates. Neuroscience can seem challenging and out of reach, however this class will try to make neuroscience and science in general more accessible and fun.

Course learning outcomes

These learning outcomes will help you meet the outcomes expected for general education courses, which include thinking critically, communicating effectively, understanding and valuing differences and using information effectively (all outcomes).

After taking this course you should be able to:

- Identify, describe and diagram the basic organization of the brain, including the functions of its major regions, the major cell types, and the basic principles of chemical signaling at synapses.
- Explain how neurons communicate; Compare and contrast neurotransmitter systems in terms of organization and function; Predict what happens to function and behavior when neurotransmitter systems are blocked or activated.
- Compare and contrast the organization and function of multiple sensory systems
- Describe the neural basis of emotions, aggression, stress, and anxiety and affective disorders
- Explain how the brain regulates sleep and wakefulness Describe the neurobiological basis of learning, memory and memory disorders (e.g., Alzheimer’s disease)

- Describe methods used in neuroscience research; Describe the cellular and gross anatomy of the nervous system; Predict how damage to the central nervous system affects function and behavior
- Develop a basic understanding of the multi-disciplinary research approaches typically used in Neuroscience and Cognitive Science.
- Use the scientific method to carry out guided experiments that explore some of the course topics.
- Convey your ideas effectively in writing and in oral presentation, drawing on a variety of reliable resources that you have analyzed critically, using effective graphs, schematic diagrams and the like, and responding thoughtfully to feedback.

Credit
3 units. Per University of Arizona policy, on average, students should expect up to 3 hours of out of class work for each hour in class (or online lecture).

Required texts
None. Course will use assigned readings posted on the D2L site (following fair-use copyright rules).

Grading:

Exam 1	100
Exam 2	100
Exam 3	100
Writing Assignments	300
Study Guides	100
Class Presentation	100
*Extra Credit	100
Total Points	800

To encourage students to help rather than to compete with each other, the course will be graded on an absolute scale in which we guarantee that if a student gets the following percentages of graded points, s/he will get the corresponding grade:

90-100% A
80- 89% B
65- 79% C
50- 64% D
0- 49% E

Exams and Final:

There will be 3 exams in this course worth 100 points each. The exams will consist of 25 multiple choice questions (2 points each) worth 50 points total and a written essay

worth 50 points (100 total). The essay question will be given to you a week before the exam.

You can prepare as much as you want but you are not allowed to bring any material that you previously worked on (i.e. a draft, notes, or figures) to the exam to answer the question. **The final (Exam 3) will NOT be cumulative and is worth 100 points.** It will be the same format as the first two Exams. You will also be given the essay question in advance to prepare for when coming to take the final.

Final Exam:

Study Guides:
There are 6 study guides in this course. You will be required to do 5 study guides each worth 20 points total. Grading is based on effort and completion not correctness. If you do not understand something you need to say what you are having trouble within the study guide, do not leave the question blank. A member of the teaching staff will reach out to you with the answer to the question. Ideal answers to the study guides will be posted after the due date. **Study guides are due by 11:59PM Arizona Time on the due date in the course syllabus**. If the study guide is < 24 hours late it you can only earn 75% of the points (15 points), 2 days late is 50% (10 points) and over 3 days it will be a 0. The last study guide is optional and can be done for extra credit worth 10 points.

Writing Assignments:
This is a writing course so you will need to complete 6 writing assignments over the course of the semester. **Assignments need to be 1-page single spaced with 1" margins and 12-point font (Arial or Times New Roman). The file must be uploaded as either a PDF or WORD document ANY OTHER FORMAT AND IT WILL BE AN AUTOMATIC zero.** Each assignment is worth 20 points and proper grammar and spelling will count as part of the grade. A rubric for grading will be posted in the writing assignment folder in D2L. For the assignments, you will be asked to read an academic paper and give what you liked about the paper, what you didn't like about the paper, and either questions that you have about the topic or what you learned from your reading. It is not important that you understand everything in the paper, correctness will not count as part of the grade. What is important is that you become familiar with how to critically look at and evaluate data and findings from source material rather than secondhand sources. These are writing exercises not how well you understand science. Your grade will come from reading and writing skills and not the level that you can speak about science. Hopefully by the end of the class you will become more familiar with scientific topics and are able to more critically and effectively write about scientific topics.

Group Presentations:
Your final exam is happening earlier than finals week to give you some space to focus on other exams and also provide you time and creative space to work on the final group project for the class. You will be divided into groups where you will choose any topic you wish about neuroscience. You will get this approved me. You can do anything you wish,

just not a traditional powerpoint presentation. We will have class time set aside for you to work on your projects. If you need to leave class to film or do something outside of the building please come to class first to check in then proceed to do whatever you need to do. More information will be given closer to the project as far as a rubric and other expectations. Group members will do a confidential evaluation on eachother rating participation, contributions and role in the group. Should you score low on these group evaluations ONLY your grade will be affected, not the other members of your group.

Re-grading policy

If you believe that there has been an error in grading of an assignment, quiz or exam, please contact me, who will review the material in question.. *You must initiate a request for re-grading within 1 week of the date on which the grade was posted*, otherwise I will not consider the request.

Subject to change statement

Information contained in the course syllabus, other than grade and course policies, may be subject to change with advanced notice, as deemed appropriate by me. Any changes to the syllabus will be announced in class and posted on the D2L website.

Classroom behavior and classroom policies regarding effective learning

You are expected to be honest in your work and adhere to the University of Arizona *Student Code of Academic Integrity* as described in the UA General Catalog. Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed.

See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity. The policies related to such issues as cheating, gorillas and plagiarism will be strictly enforced. Conduct prohibited by this Code consists of all forms of academic dishonesty, including, but not limited to:

- Cheating, fabrication, facilitating academic dishonesty, and plagiarism as set out and defined in the Student Code of Conduct, ABOR Policy 5-308-E.10, and F.1.
- Submitting an item of academic work that has previously been submitted or simultaneously submitted without fair citation of the original work or authorization by the faculty member supervising the work.
- Violating required disciplinary and professional ethics rules contained or referenced in the student handbooks (hardcopy or online) of undergraduate programs.
- Failing to observe rules of academic integrity established by a faculty member for a particular course.
- Attempting to commit an act prohibited by this Code. Any attempt to commit an act prohibited by these rules shall be subject to sanctions to the same extent as completed acts.

- Assisting or attempting to assist another to violate this Code.

In addition, we know that individuals in groups can learn best when all are considerate of each other. Therefore, I ask that you please help to make the environment in the classroom conducive to effective learning. This includes such things as turning off your cell phone, only using your laptop for class-related activities, refraining from conversation that is not geared toward the topic of the day, arriving on time, and leaving when class is finished, not before or in the middle of class. Read the full Student Code of Conduct at: http://dos.web.arizona.edu/uapolicies/scc5308abcd

The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, also prohibits threats of physical harm to any member of the University community, including to one's self. See: http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students. The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy Policies against discrimination and harassment, along with offices for reporting concerns related to discrimination or harassment, can be found at http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy. If you believe that you have been subjected to discrimination, harassment, or retaliation in violation of this policy, you should report the matter immediately to the Dean of Students to obtain information about resolving concerns, including complaint-filing options and procedures, and to enable the University to take prompt remedial action. If the alleged policy violator is another University student, you also should contact the Dean of Students.

Dean of Students
Dean of Students Office
Old Main 203
P.O. Box 210021
Tucson, AZ 85721-0021
(520) 621-7057
dos-deanofstudents@email.arizona.edu (link sends e-mail)

Course withdrawal or incomplete requests
Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

Language

You should be aware that some course content, materials and resources may involve mature themes and occasional use of language that may be considered offensive to some.

Faculty ownership rights in lecture notes and course materials

I hold the copyright in my lectures, lecture slides, quizzes and exams, and other original course materials. This copyright includes notes for students or summaries that substantially reflect my lectures or materials. These materials are made available only for personal use by students in this class, and *you may not distribute or reproduce the materials for commercial purposes without my express written consent*. (This does not prevent you from sharing notes on an individual basis for personal use.) Violation of my copyright may result in course sanctions and would violate the Code of Academic Integrity.

Confidentiality of student records
Please see http://www.registrar.arizona.edu/ferpa/default.htm

Attendance: Attendance at classes will not be recorded, but regular attendance at lectures is considered to be essential for satisfactory understanding of the course material. All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students will be honored. **A student who does not appear for a quiz or exam without an official excuse will receive a 0 for that quiz or exam**. If a student misses the mid-term or final exam, a make-up exam will be allowed only in cases of well-documented emergencies, with approval of instructor. Make-up exams may be modified from the original and will be given as close to the exam date as possible.

Face coverings are required in our classroom: Per UArizona's **Administrative Directive**, face coverings that cover the nose, mouth, and chin are required to be worn in all learning spaces at the University of Arizona (e.g., in classrooms, laboratories and studios). Any student who violates this directive will be asked to immediately leave the learning space and will be allowed to return only when they are wearing a face covering. Subsequent episodes of noncompliance will result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied. The student will not be able to return to the learning space until the matter is resolved.

The Disability Resource Center is available to explore face coverings and accessibility considerations if you believe that your disability or medical condition precludes you from utilizing any face covering or mask option. DRC will explore the range of potential options as well as remote course offerings. Should DRC determine an accommodation to this directive is reasonable, DRC will communicate this accommodation with your instructor.

Physical distancing is required in our classroom: During our in-person class meetings, we will respect CDC guidelines, including restricted seating to increase physical distancing. Any student who does not maintain physical distance from others may be asked to immediately leave the learning space. Noncompliance may result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied.

Classroom attendance:

- If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify your instructors if you will be missing an in person or online course.
- Campus Health is testing for COVID-19. Please call (520) 621-9202 before you visit in person.
- Visit the UArizona COVID-19 page for regular updates.

Academic advising: If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

Life challenges: If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges: If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

- **Exams**: Exams will be open or available in D2L
- **Equipment and software requirements**: For this class you will need daily access to the following hardware: [laptop or web-enabled device with webcam and microphone]; regular access to reliable internet signal; ability to download and run the following software: [web browser, Adobe Acrobat, etc.].
- **Remain flexible:** If pandemic conditions warrant, the University may require that we return to remote operations. If that is the case, we will notify you by D2L Announcement and email that we are moving to remote operations.
- **Class Recordings:**
  - Lecture recordings (used at the discretion of the instructor), will be created and posted. Students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies are subject to suspension or civil action.

Course Schedule:

WA = Writing Assignment
SG = Study Guide

SG* = Optional/EC Study Guide

NSCS 170c Frontiers in Brain Science (Lecture)			
Lecture Topic	**Lecture Date**	**Writing Assignment**	**Due Date**
Class Introduction: History of Neuroscience	22-Aug		
What is a Neuron?	24-Aug		
Assignment SG 1	29-Aug		
Extracredit 1	31-Aug		
Neuronal Excitability	5-Sep	SG1	12-Sep
Synaptic Transmission	7-Sep	WA 1	19-Sep
Synaptic Plasticity	12-Sep		
The Motor System	14-Sep		
Review	19-Sep	SG2	20-Sep
Exam 1	21-Sep		
Hippocampus	26-Sep		
Amygdala	28-Sep	WA 2	5-Oct
Depression and Anxiety	3-Oct		
Addiction	5-Oct	SG3	17-Oct
Addiction II	10-Oct		
Parkinson's Disease	12-Oct	WA 3	20-Oct
Alzheimers Disease	17-Oct		
Review	19-Oct	SG4	7-Nov
Exam 2	24-Oct		
Class Disease	26-Oct		
Biohacking	31-Oct		
Default Mode Network	2-Nov	WA 4	21-Nov
Artificial Intellegence	7-Nov	SG5	28-Nov
Class Disease	9-Nov		
Brain Machine Interfaces	14-Nov		
Review	16-Nov	SG6	5-Dec
Final Exam	21-Nov		
Thanksgiving (No class)	23-Nov		
GROUP PREP	28-Nov	WA 5	7-Dec
GROUP PREP	30-Nov		
Last Day of Term	5-Dec		
PRESENTATIONS	7-Dec		
Final Exam	12-Dec	EC Writing Assignment	12-Dec

NROS 210A Contemporary Approaches to Neuroscience

Fall 2024

Course Information

Course Description

This course will provide a principle understanding of how neural systems encode sensory information and form perceptions of the external world, make decisions, and generate movements, and control behaviors and other physiological processes by description and analysis of neural circuits.

Credit. 1 unit. Per University policy, on average, students should expect up to 2 hours of work out of class for each hour in class.

Course Objectives

Through lectures and hands-on classroom experiments, *students will learn* how electrochemical nerve signals control body movement, neural function, reflexes, and overall brain activity. Further, *students will explore* how the nervous system can interact with machine interfaces, including prosthetics.

Expected Student Learning Outcomes

Students completing this course will be able to:

Understand and categorize how neurons are the basic components of the nervous system. Students will comprehend how their interactions drive basic behaviors in organisms including respiration, cardiovascular function, reflex activity, and brain-related functions such as learning and memory.

Engage in active learning activities on the physiological functioning of the nervous system in live subjects (humans and invertebrates) including the development and execution of original experiments. To do this, we will supply all students with Neuroscience Education equipment developed by "Backyard Brains" for use during the semester.

Engage in activities exploring potential technological applications of their proposed projects and their societal/ethical impact and implications.

Apply the scientific method to questions relevant to neuroscience; design and conduct experiments to increase understanding of fundamental questions in neuroscience.

Course schedule and topics

Course Name	**Location**	**Topic**	**Reading**
NROS 210A Monday 10:00AM - 10:50AM	**TBD**		
Week:	Date	Speaker	Resources
Week 1: What is the nervous system	19-Aug	Lecture	The histological slides and drawings of Cajal. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2845060/
Week 2: Introduction to BYB equipment	26-Aug	BYB equipment	https://backyardbrains.com/experiments/spikerbox

Week 3: How do neurons communicate with each other?	2-Sep	Lecture	The interplay between electrical and chemical synaptogenesis. https://journals.physiology.org/doi/full/10.1152/jn.00398.2018
Week 4: How do drugs influence the brain?	9-Sep	Lecture	Silent Synapses in Cocaine-Associated Memory and Beyond. https://www.jneurosci.org/content/41/45/9275
Week 5: Techniques in Neuroscience	16-Sep	Lecture	Putting big data to good use in neuroscience. https://www.nature.com/articles/nn.3839
Week 5: BYB Data Analyses Tutorial	23-Sep	BYB Muscle Box EMG	https://backyardbrains.com/experiments/muscleSpikerBoxPro
Week 6: Electrophysiology in Neuroscience	30-Sep	Ricoy	Animal electricity and the birth of electrophysiology: the legacy of Luigi Galvani. https://doi.org/10.1016/S0361-9230(98)00026-4
Week 7: Big Questions in Neuroscience	7-Oct	Ricoy	
Week 8: Introduction to EEG	14-Oct	BYB heart and Brain Spikerbox	https://backyardbrains.com/experiments/EEG
Week 9: EEG testing	21-Oct	BYB heart and Brain Spikerbox	https://backyardbrains.com/experiments/quantifyyoureeg
Week 10: Final Projects	28-Oct	Ricoy	Hands-On in Class Activity
Week 10: Final Projects	4-Nov	Lab	Hands-On in Class Activity
Week 11: Neurophysiological Recordings In Vivo	11-Nov	Lab	Hands-On in Class Activity
Week 12: Final Projects	18-Nov	Lab	Hands-On in Class Activity
Week 13: Final Projects	25-Nov	Lab	Hands-On in Class Activity
Week 14: Final Projects	2-Dec	Lab	Hands-On in Class Activity
Week 15: Final Projects	9-Dec	Lab	Hands-On in Class Activity
Week 16:	16-Dec		Final Project Presentations
Week 17: Final Exam Days	23-Dec		Final Project Presentations

Grading

Lecture-related assignments (25%):

There will be **five short essay assignments (5% each**; approximately 1-2 pages long) based on the topics from some of the lectures. Two of these assignments will be individually answered and the other three will be completed in randomly assigned small groups where each group will receive the same overall grade (unless group members inform me through email that one or more group member(s) did not contribute equally to the assignment).

Lab Materials, Grading, and Lab Policies

Lab (25% lab assignments / 10% notebook = 35% of total grade): We will explore the basic concepts of nervous system function and its communication with the body using the equipment designed by Backyard Brains (BYB; https://backyardbrains.com/). Each student group will receive their own BYB equipment set for use during the semester, and you will be responsible for its care and use. The BYB products all have a focus on neuroscience but have expanded into multiple STEM research fields. Their Neuron Spiker Box kits record directly from neurons in invertebrates. Their Human Physiology kits enable you to record the electrical activity of nerves in motor units during muscular contractions (electromyogram; EMG), from the heart (electrocardiogram; EKG), and even from the whole brain (electroencephalogram; EEG). These neuro-engineering devices even let you use your nervous system to control computers and robotics. We will be using the following BYB setups: Human-Human interface (http://bit.do/BYB-HHI), Muscle Spiker Box (http://bit.do/BYB-MSB), the claw (http://bit.do/BYB-Claw), heart and brain Spiker Box (http://bit.do/BYB-HBSB and http://bit.do/BYB-HBSB2), and the reaction timer/reflex hammer (http://bit.do/BYB-RTRH). A total of five lab assignments (written lab reports; 5% each) will be given based on some of the laboratory experiences, most of these assignments will be group projects where each group will receive the same overall grade (unless group members inform me through email that one or more group member(s) did not contribute equally to the assignment). An additional 10% of the grade will consist of keeping a virtual notebook which will consist of a google doc (word document) which each of you will share with me (how to create and share a google doc: http://bit.do/1099-share). In this notebook you will write all information and experiments done in all twelve lab projects including the description, results and analysis of your final research project (read below).Your lab notebook grade will be given based on proper organization and detail (you want to write on this notebook as if another student would take this class in the future and learn the experiments by reading your lab notes).

End-of-semester group research project (30%): After acquiring experience using the BYB laboratory-related equipment during the semester, you will develop a science project with two or three other classmates (depending on class enrollment). This project will utilize one of the BYB setups and will focus on a specific scientific question and hypothesis following the principles of the scientific method. The research project deliverable will consist of a 20-minute PowerPoint presentation which will be given by the group on the last day of the course via Zoom, and a PDF file of the presentation with a short writeup (2-3 pages) describing the project and results. All members of the group must participate in the presentation. The presentation must include an introduction, project rationale, research question, hypothesis, data, analysis, and conclusions (including a slide with any bibliography used). The group will receive the same overall grade (unless group members inform me through email that one or more group member(s) did not contribute equally to the assignment). We will discuss with more detail the nature of the final research during the last few weeks of the course (please see course schedule for more details).

Class attendance, preparation and participation (10%): Since lectures and labs will often include discussion, it is crucial that each student prepare for class by reading the assigned material ahead of time. This, as well as your general class participation, will count towards “class preparation.” Unexcused absences (informed before or within the same day of class) to class or labs and repeated tardiness to class or labs will affect your class participation grade. If a student can’t make a class due to a previously informed illness or other valid personal situation, the student will be given a chance to make up the class via homework.

Grading Information

Grading Scale

You are expected to attend and actively participate in every phase of the course. Final grades will be based on total points. Your grade for each assignment will be posted in D2L.

Total possible points:

A excellent (regular grade) 90-100 %

B good (regular grade) 80-90 %

C satisfactory (regular grade) 70-80%

D poor (regular grade) 60-70 %

E failure (regular grade) 50-60 %

Grading Policies

Late assignments

Assignments turned in up to a day late (from the posted deadline) will lose half of the possible points available. Without permission given before the posted deadline, assignments will not be accepted more than 1 day late.

Re-grading policy

If you believe that there has been an error in grading of an assignment, quiz or exam, please contact the instructor who will review the material in question. *You must initiate a request for re-grading within 1 week of the date on which the grade was posted*, otherwise we will not consider the request.

Required extracurricular activities

Not applicable

Final Exam or Project

Final exam schedule link https://registrar.arizona.edu/faculty-staff-resources/room-course-scheduling/schedule-classes/final-exams/final-exams-fall-2024

Required Competencies - Course Prerequisites or Corequisites

This course assumes that you don't have a strong grounding in the fundamentals of cellular neurophysiology. Classes will include lecture as well as small-group discussions and small projects/problem-solving exercises.

Pre-requisite courses: None

Materials and Technical/Computer Information

Texts or Readings

Besides the course materials posted on D2L, we have a several books in the NSCS library that can serve as recommend reference such as:

1. Kandel, ER. *et al*. (2021) *Principles of Neural Science* 6th edition. New York: McGraw Hill Medical. ISBN 9781259642234. Note: a previous version (5th edition, 2013) can also be used, the electronic version of this book (5th edition, 2013) is available to students in UA library.

Note: this textbook is the most comprehensive reference book, but it contains much more information than is covered the course.

2. Luo, L (2020) *Principles of Neurobiology*. New York: Garland Science. ISBN 9781003053972. Note: this is a relatively concise textbook focusing on key experiments.
3. Bear, MF. *et al*. (2016) *Neuroscience: Exploring the Brain, 4th Edition*. Philadelphia: Wolters Kluwer. 978-2-36110-080-3.
4. Purves, D. *et al*. (2018) Neuroscience 6th edition. New York: Oxford University Press. ISBN 9781605353807.

Required or special materials

None

Course and University Policies

Safety on Campus & in the Classroom

For a list of emergency procedures for all types on incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview.

Also watch the video available at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy000000000003560.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Nondiscrimination and Anti-harassment Policy

University Policy 200E on prohibited behaviors: http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Class Participation and Absence Policy

Accessibility and Accommodations: At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu) to establish reasonable accommodations.

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences

Accommodations for students with disabilities

Statement for reasonable accommodations provided by the Disability Resources Center: drc.arizona.edu/instructors/syllabus-statement

Subject to Change Statement

Information contained in the course syllabus, other than grade and course policies, may be subject to change with advance notice, as deemed appropriate by us. Any changes to the syllabus will be announced in class and posted on the D2L website.

Academic Integrity policy

Student Code of Academic Integrity that prohibits plagiarism: deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity

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How to find an article on PubMed

Go to the UAz website→academics→libraries→health sciences library→databases→click on the P in the list of alphabet letters→scroll down to PubMed (HSL)→type in whatever you are looking for.

You can type in a doi, a PMID, an author's last name (if there are several authors, type in the last names of several of them), an article title, or simply key words. Once you have clicked search, you can further specify some limits, like you want a review in the last 5 years or the species of animals or clinical trials, etc.

Once you find an article you want in the list, click on the title which usually will bring you to a page with the title, authors, journal, and abstract. Up in the right-hand corner, you will find some buttons to get the full article. Usually all of them will work, but sometimes only one will. Click on one of the buttons. Somewhere on the page that comes up you will find a button that says "pdf". Click on that. You'll usually get an html version of the pdf. If so, click on the page icon on the top right to download the pdf, and save that version. *These articles are all free.*

Occasionally, you will run into as article for which the UA system does not have an institutional subscription. Not to worry. Go back to the database page and click on "request materials" →interlibrary loan. That will get you to a page to type in the info needed for the library to go out on its network to find you a copy. Within a couple of days, sometimes even the same day, you will get an email with a link to a pdf.

NROS 215: Introduction to Electrophysiology (3 credit hours)
NROS 415: Electrophysiology Laboratory (3 credit hours)
SYLLABUS
Last updated: January 10, 2017

Time and Place: M 1-2:50P, W 12-2:50P (all lab)
All class meetings will be held in Gould Simpson room 404, the electrophysiology teaching lab. You will be given a code for this door, not to be shared with others. You may request a key to the outside doors, giving you 24-hour access to the lab.

Instructor:
Dr. Charles M. Higgins, Associate Professor, Depts. of Neuroscience / Electrical Engineering
Email: higgins@neurobio.arizona.edu
Office: Gould Simpson 430, not far from the teaching lab
Office Hours: talk to me in lab, or by email appointment

Teaching Assistant:
Samer Masri, Department of Physiology
Email: masri@email.arizona.edu

Course format:
Every week the instructor will lead an interactive discussion about whatever you might need to know for present and future laboratory work. The course is in 4 parts of about 4 weeks each, and at the end of each part you will be tested on your practical skills and prepare a short written report. *Your job while in discussion/lab is to prepare yourself for the practical test. Take good notes!* Despite the formal lecture/lab segregation required by the UofA computer system, as the course progresses, you will find that more and more time is spent on laboratory work and *ad-hoc* discussions, and entire periods dedicated to "lectures" completely disappear.

Distinction between 215 and 415:
- NROS 215 is intended for freshmen and sophomores, and NROS 415 for juniors and seniors. You cannot take both of these courses; rather, you must choose at which level you'd like to be involved in the laboratory. Clearly NROS 415 is more attractive on a transcript.
- Students in NROS 215 will be evaluated in written reports and laboratory practical exams as beginning students with little to no laboratory experience, and written communication skills not far advanced beyond a high school level. Thus NROS 215 students will be allowed more help during a practical to receive a high score, and similarly will be allowed more mistakes in written reports to get a high score. This standard is relative to students in NROS 415, and should not be misconstrued to indicate that a low quality standard will be enforced!
- Students in NROS 415 will be evaluated at a higher standard, as advanced students with some laboratory experience, and significantly enhanced written communication skills beyond a high-school level. As such, NROS 415 students will be expected to perform more independently on practical exams, write higher-quality written reports, and do more comprehensive data analysis relative to students in NROS 215.

Course Website:
All information about the course, including the syllabus, additional reading materials and assignments will be posted at the course's D2L website. It is your responsibility to check that website regularly to check for announcements and other important course information. Additional information can be found at http://nros415.com.

Course Objectives: This course will provide you with detailed hands-on laboratory experience in recording electrical signals from living cells including more advanced preparations and data analysis.

Expected Learning Outcomes:
At the completion of this course you are expected to understand:

1. Practical techniques for preparing brains for recording
2. Practical use of equipment used for electrophysiology
3. The basics of real neuronal function
4. The fundamentals of computer analysis of recorded data

Prerequisites/Corequisites: None

Teaching Format
Discussion/lab at all meetings.

Required Textbook and Other Readings
No text. Readings may be available from the D2L website.

Class Topics

- **Part I: Introduction to the lab, muscle recording and stimulation (4 weeks)**
    1. The basics: electrodes, recording equipment, tools for preparation
        Lab: setting up the lab station
    2. *Sarcophaga bullata*: introduction and anatomy
        Lab: anatomical preparation
    3. Demonstration of preparation
        Lab: muscle recordings and stimulation
    4. Practical exam

- **Part II: Ventral nerve cord recordings (4 weeks)**
    1. Insect ventral nerve cord anatomy
        Lab: anatomical preparation
    2. Demonstration of preparation
        Lab: ventral nerve cord preparation
    3. Processing VNC data
        Lab: Recording and data processing
    4. Practical exam

- **Part III: Central brain (optic lobe) extracellular recordings (4 weeks)**
  1. The insect visual system; optic lobes; visual stimulus creation
     Lab: Anatomical preparation
  2. Visual neuroanatomy, preparation demonstration
     Lab: Central brain recordings
  3. Hook electrode recordings
     Lab: Central brain recordings
  4. Practical exam

- **Part IV: Recordings from humans (skin conductance and EMG) (4 weeks)**
  1. Significance of skin conductance, how it can be measured
     Lab: introduction to skin conductance meter
  2. Electromyograms on humans
     Lab: introduction to EMG recordings
  3. What will elicit a skin conductance response?
     Lab: Fun with higher primates
  4. Practical exam

Grading:
Regular grades will be given for this course: ABCDE. Grades will be based on 4 practical exams and 4 lab reports as shown below. **Late reports will lose 20% of their grade every day, or portion thereof, that they are late.**

Practical exam I	15%
Lab report I	10%
Practical exam I I	15%
Lab report II	10%
Practical exam I II	15%
Lab report III	10%
Practical exam I V	15%
Lab report IV	10%

If you get the following percentage of graded points, you will get the corresponding letter grade:

90-100% A
80- 89% B
65- 79% C
50- 64% D
0- 49% E

This scale may be slid *down* at the instructor's discretion.

Lab report format:
Each lab report must contain the following elements, always keeping in mind that the purpose is to allow others to reproduce your data. **All lab reports must be in PDF format in your appropriate D2L assignment folder. No, Word format is never acceptable!!**

- Organism: Usually *Sarcophaga bullata* (the flesh fly), but sometimes dragonflies, or even humans!
- Preparation: How did you restrain, dissect, and otherwise prepare the organism for recording?
- Equipment: This section includes the equipment you used, all settings on that equipment, and what you used as an electrode.
- Experiments: What experiments did you perform? Did you have a hypothesis you were testing or a question you were trying to answer?
- Results: What experimental data did you collect? What did you observe?
- Discussion: What do you infer from your results? Can you answer your question, or address your hypothesis? Are other experiments suggested?

Course and University Policies:

- **Attendance**: Since your grade is based on laboratory performance, there is no textbook, and I only demonstrate things once, **it is essential that you attend every class meeting**. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable; **please inform the instructor of any conflicts at the beginning of the semester**. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. The UA's policy concerning class attendance, participation, and administrative drops is available online. Students who miss class due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences. **The instructor reserves the right to deduct a portion of course credit for repeated tardiness or absence at 5% per missed class period.**
- **Requests for incomplete or withdrawal** must, surprisingly, be made in accordance with the linked University policies.
- **Academic conduct**: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the University of Arizona Code of Academic Integrity.
- **Threatening student behavior:** The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to oneself. Threatening or disruptive student behavior will not be tolerated in accordance with University policy.
- **Disabilities**: Our goal in the classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let the instructor know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Resource Center to establish reasonable accommodations. If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.
- **Confidentiality of Student Records**: Student records will be kept confidential as required by University Policy and Federal Law.
- **Expected classroom behavior**: University Policy forbids the use of cellular phones and other computing devices during class in cases where it distracts from or disrupts the course. This rule generally still holds true here. However, you are encouraged to use your cellular phone, computer, and any other computing devices that may be nearby, worn on, or embedded in your person to help the class get the answers to discussion questions. This particular use of cell phones is not disruptive.
- **Plagiarism**: I encourage you to look carefully at Prohibited Conduct in the University Code of Academic Integrity, especially where it addresses plagiarism. This seemingly blatant behavior can be more subtle than you might believe. ***Nota bene,*** the policy forbids assisting others to plagiarize. Thus if you provide the results of your experiment to the class on Facebook and it shows up in multiple written reports, you and all of the students who used your data have violated the Code of Academic Integrity.
- **Non-discrimination and anti-harassment**: The University is committed to creating and maintaining an environment free of discrimination. University Policy prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. The University encourages anyone who believes he or she has been the subject of discrimination to report the matter immediately at the link given above.
- If you have really been enjoying the long and ever-growing list of University Policies above, you might want to read the whole list. I'm particularly fond of the Policy on Policies, which is how these keep multiplying.

Faculty Ownership Rights of Lecture Notes and Course Materials:
The instructor holds the copyright to all questions, lectures, slides, quizzes, exams, and any other original course materials, whether in written, electronic, verbal, or any other form. *Class sessions may not be audio- or video-recorded without the instructor's specific written consent*. This copyright includes student notes or summaries that substantially reflect the instructors' lectures, discussions, or materials. These materials are made available only for personal use by students, and *students may not distribute or reproduce the materials for commercial purposes without the instructor's specific written consent*. This does not prevent students from sharing notes on an individual basis as protected by the "fair use" doctrine of copyright law. Violation of the instructors' copyright may result in course sanctions and violate the Code of Academic Integrity.

Subject to Change Statement:
Information contained in this syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor. Any changes to this syllabus will be announced in class and posted on the D2L Website.

Something I wish I had known at your age:
(quoted from an article by Prof. Amy Weldon in the Chronicle of Higher Education, January 2017[1])
"As you begin your college career, which might eventually involve asking professors to recommend you for graduate programs, jobs, or internships, please be aware that professors are not obligated to write references for any student who asks us. I don't write a reference for a student unless I can write a very positive and specific one. Therefore, your job as a college student is to become the kind of student professors can rave about in recommendations — hardworking, collegial, and intellectually inquisitive and honest. Consider maintaining relationships over time with professors, so that they know you well enough to write for you. Many juniors and seniors tell me they wish they had thought about this during their first year."

[1] Prof. Amy Weldon (Luther College), "Claiming Your Right to Say No", Chronicle of Higher Education *Vitae*, January 2017.

COURSE SYLLABUS NSCS 200 Fall 2024

Course Title and Number:
Fundamentals of Neuroscience and Cognitive Science (NSCS 200)

Description of Course:
Fundamental concepts in the development, evolution, organization and function of neural circuits underlying behavior, including biological, ethological, computational and psychological perspectives. The course will provide an introduction to the principles of neuroanatomy, neurophysiology and cognitive science. Topics will be addressed with material from philosophy, psychology, computer science and neuroscience, and will incorporate data from work with animals, humans and machines.

Locations and Times:
T, Th 11:00 – 12:15 The Commons Building, Room 305, 1306 E University Blvd

Instructor Information:

Jessica Andrews-Hanna, Ph.D. (she/her)
Associate Professor, Psychology / Cognitive Science
Email address: jandrewshanna@ arizona.edu
Office hours: Thursdays, 12:30pm-1:30pm (see zoom link on D2L)

Dr. Julie E. Miller, Ph.D. (she/her)
Associate Professor, Neuroscience & Speech, Language and Hearing Sciences
E-mail address: juliemiller@arizona.edu
Office hours: Mondays, 5-6pm (starts 9/9) and by appointment (see zoom link on D2L)

Teaching Assistant:

Vannia Puig Rivera, M.A. (she/her)
Graduate Student in Psychology; Cognitive Science Minor
Email address: vapuigrivera@arizona.edu

Preceptors:

Carol Chen (she/her) (Neurobiology Track) - cychen@arizona.edu
Cole Dunnett (he/him) (Neurobiology Track) - coledunnett@arizona.edu
Kabir Muthu (he/him) (Cognitive Science Track) - kabirrm25711@arizona.edu
Harleen Uppal (she/her) (pre-law or Cognitive Science Track) - harleenu@arizona.edu

Office Hours for TAs/Preceptors: To be announced during each unit and by appointment. To schedule a time to meet with a preceptor/TA, email them.

Course Website: All information about the course, including the syllabus, additional reading materials and lecture slides will be available on the D2L website. It is your responsibility to check the course website regularly for announcements and other important course information.

Course format:
This course will be taught in person with lectures also recorded via Panopto. Lecture slides will be posted to D2L before class, and lectures will be recorded and available via Panopto after the lecture.

Course Objectives and Expected Learning Outcomes:
This course is intended to provide a rigorous introduction to topics fundamental to modern brain and cognitive science. Topics range from the cellular and molecular principles necessary to understand normal brain function and clinical disorders, to the approaches of cognitive science that provide a clearer understanding of complex human behavior. This course serves as the initial required course for the Neuroscience and Cognitive Science (NSCS) undergraduate major.

Learning Outcomes:
Upon completion of this course, students should be able to:
1) Describe the general organization of the brain and its relation to physiological and cognitive processes. Explain the fundamental principles of anatomical and functional organization of neuronal circuits and networks underlying the complex capacities of the mind. (NSCS Program Learning Objective A1)
2) Explain, including diagrams, the basic molecular and cellular mechanisms underlying neural excitability and synaptic physiology and predict the consequences of disrupting various elements of the underlying mechanisms. (A2)
3) List and explain several common principles of sensory processing across modalities, describe the basic features of the motor system, and explain how sensory-motor signaling operates. (A3)
4) Summarize contemporary understanding of the biological bases of and the cognitive processes underlying behavior, including sensation, perception, language, learning, and memory. (A6)
5) Describe the basic cognitive processes and primary circuitry involved in language, decision-making, thinking/reasoning, motivation, emotion, and consciousness. Give examples of normal range of cognitive, emotional and behavioral variability over the lifespan. (A7)
6) Outline evolutionary principles that support use of animal model systems and explain how innate/genetic factors and environment/experience are understood to interact in development. (A8)
7) List the basic steps in establishing the wiring plan of the nervous system, including common molecular signaling pathways. Differentiate activity-independent and -dependent steps. (A9)
8) Describe the cognitive, genetic, molecular, and cellular bases of several common diseases and disorders of the nervous system. Discriminate among these disorders in terms of their presentation and include the clinical tools typically used in diagnosis. (A10)
9) At a fundamental level, explain the common methodologies and experimental designs used in research in neuroscience and cognitive science. Evaluate the soundness of the methodological design of descriptive, correlational, and experimental research. Design, interpret, and evaluate simple cognitive, behavioral, and cellular experiments. (A11)

Prerequisites: In progress or completed Psych 150A, MCB 181 (or PSIO 201 or 202 instead of MCB 181). Instructors also have discretion to waive requirements based on review of prior classes taken other than those listed.

Honors Credit:
There is no honors credit offered for this course.

Course Communications:
Announcements will be posted at the beginning of each lecture and on D2L. Students are responsible for staying up-to-date on these announcements. We will also email students to reinforce some announcements.

Textbooks and other Readings:
There is no required textbook to purchase for this course, but we will post articles of interest to D2L if students want to follow up on a particular topic. Tests will be based entirely on content presented in the lectures and may include that from discussion activities. Lecture slides will be posted on the D2L site, and students should take careful lecture notes. Students interested in reading beyond this content can consult any introductory Neuroscience or Cognitive Science book. We particularly recommend the following:

1) Bear MF, Connors BW and Paradiso MA, *Neuroscience Exploring the Brain,* 3rd-4th edition, Wolters Kluwer
2) Watson, NV and Breedlove MC, *The Mind's Machine, Foundations of Brain and Behavior,* 2nd ed. Sinauer Associates, Inc.
3) Goldstein B, *Cognitive Psychology: Connecting Mind, Research, and Everyday Experience*" 4th Edition. Cengage Learning
4) Ward, J. (2015). *The Student's Guide to Cognitive Neuroscience.* (3rd ed.) London: Psychology Press.

A useful web site for enhancing your understanding of cellular neurophysiology using simulations (resting membrane potentials, action potentials) may be found at this free neuroscience online resource:
https://nba.uth.tmc.edu/neuroscience/
General JOVE videos: https://www.jove.com/science-education-library/5/neuroscience

Primary publications and website suggestions related to the lectures will be available on the D2L course site.

Schedule of Topics

DATE	TOPIC	INSTRUCTOR
27-Aug	Introductions, Course Overview, Syllabus	JAH/JEM
29-Aug	Intro to Cognitive Science / Methodology	JAH
3-Sept	Consciousness	JAH
5-Sept	Vision	JAH
10-Sept	Hearing	JAH

12-Sept	Taste & Smell	JEM
17-Sept	Motor Systems	JEM
19-Sept	Motor Systems & Disease	JEM
24-Sept	**EXAM 1**	
26-Sept	Attention	JAH
1-Oct	Memory I	JAH
3-Oct	Memory II	JAH
8-Oct	Neural Control of Speech	JEM
10-Oct	Language and Concepts	JAH
15-Oct	**EXAM 2**	
17-Oct	Emotion	JAH
22-Oct	Executive Functioning	JAH
24-Oct	Decision Making	JAH
29-Oct	Cognitive Development	JAH
31-Oct	Intro to Neuronal Structure & Function	JEM
5-Nov	Neuronal Membrane Biophysics I: Resting Potential	JEM
7-Nov	Neuronal Membrane Biophysics II: Action Potential	JEM
12-Nov	**EXAM 3**	
14-Nov	Synaptic Transmission: Chemical & Electrical	JEM
19-Nov	Synaptic Transmission/Spinal Cord JEM	JEM
21-Nov	Cellular Plasticity and Learning/Memory	JEM
26-Nov	Spinal Cord & Brain Anatomy	JEM
28-Nov	***Thanksgiving***	
3-Dec	Cellular Development	JEM
5-Dec	NSCS Paper Discussions	JEM/JAH
10-Dec	Exam Q&A	JEM/JAH
17-Dec, 10:30am start	**EXAM 4 (not cumulative)**	

Grading Policy:
Point Breakdown:

Exam 1, 2, 3, 4 (Final-not cumulative)	20 points each = 80 points
Discussion Assignments (8@2 pt)	2 points each = 14 points (1 discussion automatically dropped)
NSCS in the News Papers	6 points
Total	**100 Possible Points**

Final Course Grade Assignments:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
E	below 60%

https://catalog.arizona.edu/policy/courses-credit/grading/grading-system

*****Please note that grades cannot be negotiated as that would not be fair to the entire class. Any final numerical grades at 0.5 decimal points or less from a new letter grade will be rounded up. For example, an 89.5 will become a 90 (resulting in an A).**

Extra Credit

Students will have the opportunity to earn a one-time 0.5 points of extra credit toward your final grade by attending office hours with any member of the instructional team (instructors, TAs, preceptors). We would like to get to know as many students as possible, and to encourage students to seek assistance with course material, if needed. To facilitate both of these things, we will give students 0.5 point extra credit as a one-time bonus for attending office hours or a meet-and-greet session. We encourage students to attend early in the semester to make the best out of the semester moving forward.

Discussion Activities

Eight times during the semester (**two per unit**) we will shift to interactive discussions or problem set work on topics related to a recent lecture. During these activities, students will discuss topics in small groups during lecture. Each student must submit their own write up on the activity under the 'Assignments' tab in D2L **within three days** for two points participation grade per activity on D2L. One discussion will automatically be dropped for all students regardless of the circumstances (no note needed, etc).

"Neuroscience in the News" Write-up and Discussion -- Mandatory (6 points)

During the second to last class of the semester (12/5/24), we will reflect upon the topics covered throughout the course by turning to recent scientific findings highlighted in news/media outlets. You will be required to search for and select one primary research publication related to a topic covered in this course (of your choosing) and prepare at least a 1.5 page, double spaced write-up due by 11:59pm 12/4/24 to D2L. The primary research article must have been published in the last five years (2019 or later). In your write-up, you should 1) describe the scientific finding highlighted by the article, 2) explain how the finding is related to material discussed in NSCS 200, and 3) evaluate / critique the article by considering the following questions: What do you see as the

article's main strengths? Why, or why not, do you think the finding is important? Are there any limitations? The write-up must be in your own words. During class, you will discuss your chosen articles in small groups, and volunteers will be given a few minutes to highlight one article to the class. Students will receive 6 pts for complete answers to these questions in their write-up. *Note that students are responsible for making sure that their "Neuroscience in the News" writeups are uploaded correctly to D2L in Word or pdf form (no Pages or Google docs). **No credit will be given for documents that are not converted or uploaded properly.**

Assignment/Testing Schedule/Due Dates:
Number of required exams: 4 (see dates above): closed book in class via D2L
Number of Discussion Assignments: 8 (each discussion announced that day in class; one dropped)
NSCS in the News Paper: 1
Readings: optional textbooks; selected chapters/articles provided on D2L
Required extracurricular activities: None
Extra credit: 0.5 points, just once: Attend office hours with Dr. Miller, Dr. Andrews-Hanna, or TAs/preceptors.

Attendance Policy:
Class attendance will not be graded. We very much recommend attending the in-person version of the lectures if you are healthy, and using the Panopto-recorded video lectures (see Class Recordings below) when necessary or to review lecture material. Many lectures will have class activities including small-group discussions that are relevant to the material and exams.

Incompletes (I) and withdrawal (W):
Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system

Absences:
Please notify your instructor if you have an emergency situation that prevents you from submitting work on time and would like to request an extension of the due date. If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office:
DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable,
https://policy.arizona.edu/employment-human-resources/religious-accommodation-policy.

Make up exams will only be allowed in cases of a Dean's excuse or emergencies, with advanced approval of instructors. The make-up exam may involve additional components, such as additional questions and/or an oral component. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class activities, please contact us as soon as possible as per the policies above.

Safety on Campus and in the Classroom:
For a list of emergency procedures for all types on incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview (link is external)**.**

Also watch the video available at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy000000000003560

UA Academic policies and procedures:

https://catalog.arizona.edu/syllabus-policies

Accessibility and Accommodations:
At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (DRC, 520-621-3268, https://drc.arizona.edu/) to establish reasonable accommodations. The **DRC is designated by the institution to ensure access for disabled students and employees.** As such, all disability documentation and requests for accommodations must be handled by DRC. Students can affiliate with DRC through an online process. Our Access Consultants work with students and collaborate with instructors and colleges regarding reasonable accommodations and DRC's processes.

Student Assistance:
https://deanofstudents.arizona.edu/support/student-assistance

Academic Advising:
If you have questions about your academic progress this semester, please reach out to your academic advisor (https://ua-trellis.my.site.com/Public/s/advisors-by-major). Contact the Advising Resource Center (https://advising.arizona.edu/) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@arizona.edu

Code of Academic Integrity:
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials with each other. **However, graded work/exercises must be the product of independent effort unless otherwise instructed**. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog.
See: https://deanofstudents.arizona.edu/policies/code-academic-integrity
The University Libraries have some excellent tips for avoiding plagiarism:
https://new.library.arizona.edu/research/citing/plagiarism

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA email to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student email addresses. This conduct may also constitute copyright infringement.

Classroom Behavior Policy:
To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed.
The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See https://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students

Nondiscrimination and Anti-Harassment Policy: The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy **(link is external).**

Statement of Copyrighted Materials:
Students are advised that all course materials disseminated by the instructor to the students, whether in-class or online (i.e. D2L), are original materials and as such, reflect intellectual property of the instructor or author of those works. Any notes and handouts are intended for individual use by the student. Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

Confidentiality of Student Records:
http://www.registrar.arizona.edu/ferpa

University-wide Policies link: http://catalog.arizona.edu/syllabus-policies

Class Recordings:
The class will not be live-streamed, but we will aim to record each lecture in Panopto, which will be uploaded to D2L à Panopto tab for later viewing. For lecture recordings, students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies Code of Academic Integrity

(https://deanofstudents.arizona.edu/policies/code-academic-integrity) and Student Code of Conduct (https://deanofstudents.arizona.edu/student-rights-responsibilities/student-code-conduct) are also subject to civil action.

UA Academic policies and procedures:
http://catalog.arizona.edu/syllabus-policies

Land Acknowledgement:
We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service. For more information about the native lands on which UArizona sits, see nasa.arizona.edu.

Commitment to Diversity, Inclusion, and Respect:
Diversity unites and moves us forward. The diverse backgrounds, experiences and perspectives that each student brings to this class will be viewed as a resource, strength, and benefit. In this class, we have a unique and important opportunity to learn from the information and ideas shared by each other, and we also a responsibility to do so with sensitivity and respect.

Ideally, science would be objective. However, as you will learn, much of science is subjective and is historically built on a small subset of privileged voices. It is important to make note of this and to think about how significant research findings may be biased by their nature of being carried out on a typically small, non-representative sample of participants.

We would like to create a learning environment for my students that honors diverse identities (including race, ethnicity, gender, age, class, sexuality, nationality, religion, ability, etc.), and supports a diversity of experiences, thoughts, and perspectives. To learn more about the UA's commitment to diversity, and inclusion, please visit https://diversity.arizona.edu/ The University is also committed to creating and maintaining an environment free of discrimination; see https://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy. Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Preferred Name and Pronouns: This course affirms people of all gender expressions and gender identities. The university recognizes that many members of its community use names other than their legal or official names first provided to the university (official/legal name) to identify themselves. For some, a chosen or preferred name may be an important component of their identity, especially their gender identity.

If you would prefer that a different name from your legal one or the one that appears on the class roster be used, the university has established guidelines that allow students and employees to indicate their chosen or preferred first names. A student or employee's preferred name will appear instead of the person's official/legal name in select university-related systems and documents (e.g.

D2L, official email display name, UAccess, etc.), provided that the preferred first name is not being used for the purpose of misrepresentation. Please see the following link for more information: https://lgbtq.arizona.edu/use-chosen-or-preferred-names

We want to be sure that we refer to you in your preferred way. If you prefer a name other than the one on our class roster, please let us know. If you have certain pronouns that you want us to use, please include them when you sign your email. We will try our best to remember your preferred names and pronouns, but please also feel free to give us a reminder. Also, students are able to update and edit their pronouns in UAccess. To change your listed pronoun on UAccess, navigate to the Student Self Service page, go to the personal information section, and click on "Names". Options include (he, him, his), (she, her, hers), (they, them, theirs), (xe, xem, xyr), and (ze, zir). More information on updating your preferred name and pronouns is available on the Office of the Registrar site at https://www.registrar.arizona.edu/ and https://lgbtq.arizona.edu/students.

Additional Resources for Students:

Service Members and Veterans:
If you are a current service member or veteran reach out to the VETS center. VETS is an organization run by veterans, spouses, dependents, and current service members who, through their shared experiences, endeavor to maintain a dynamic and effective program which is responsive to the needs of the community. More information can be found at https://vets.arizona.edu.

Basic Needs Statement:
Basic needs insecurity affects 1 in 3 college students at the University of Arizona, which can impact students both inside and outside of the classroom and affect their opportunity to learn. Any student who has difficulty accessing sufficient food, clothing, and hygiene items or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries and the Campus Closet is available for free clothing items. For all information about on-campus and off-campus resources, please visit https://asuatoday.arizona.edu/basic-needs/overview.

Mental Health Resources:
Personal concerns such as stress, anxiety, depression, attentional difficulties, relationship difficulties, etc. can interfere with your ability to succeed and thrive at the University of Arizona. UA has assembled an excellent set of health-related resources at https://health.arizona.edu. For helpful links to mindfulness exercises, free mental health apps, mental health groups, and other tools to help cope with stress, click on the "Support Your Mental Health" link in this webpage: https://health.arizona.edu/take-charge-your-well-being-2021.

For UA's Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334. Relatedly, if you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office's Student Assistance Program helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health,

victimization, and relationship issues, through a variety of interventions, referrals, and follow up services. https://deanofstudents.arizona.edu/support/student-assistance
Email: DOS-deanofstudents@email.arizona.edu (link sends e-mail) Phone: 520-621-7057

Are you in crisis? Here are some ideas about where to go or who to call:

Located in Tucson? Call the Community-Wide Crisis Line 24 hours a day, 7 days a week at 520-622-6000. https://www.namisa.org/crisis-line/

Are you a University of Arizona student? If it is not an emergency and you are a UA student, call or walk-in to Counseling and Psych Services at 520-621-3334 Monday - Friday. Walk-in triage is available between 9 am and 4 pm Monday - Friday.

Are you a concerned friend? Concerned friends can find out more about helping a friend who might be experiencing problems through our Friend 2 Friend website:
https://friend2friend.arizona.edu/

Resources for sexual assault, relationship violence, and stalking: The UA CAPS Oasis Sexual Assault and Trauma Services (Oasis) can be reached at 520-626-2051.
https://survivorsupport.arizona.edu

24-Hour Hotlines:

The National Suicide Prevention Lifeline is a 24-hour, toll-free, confidential suicide prevention hotline available to anyone in suicidal crisis or emotional distress. By dialing 1-800-273-TALK (8255), the call is routed to the nearest crisis center in our national network of more than 150 crisis centers. The Lifeline's national network of local crisis centers provides crisis counseling and mental health referrals day and night. https://988lifeline.org/

Crisis Text Line: Text HOME to 741741 from anywhere **in the United States**, anytime, about any type of crisis. A live, trained Crisis Counselor receives the text and responds, all from a secure online platform. Find out more about how it works at https://crisistextline.org

Suicide Prevention for LGBTQ Youth through the Trevor Project
(https://www.thetrevorproject.org/get-help/#sm.0000n8i5bxqvkcwf10zbfu33lvh1r)

- The Trevor Lifeline is a 24/7 suicide hotline: 866-4-U-TREVOR (1-866-488-7386)
- TrevorChat: Online instant messaging available 7 days a week, 3 pm – 10 pm ET (12 pm – 7 pm PT)
- TrevorText: Confidential and secure resource that provides live help for LGBTQ youth with a trained specialist, over text messages. Text TREVOR to 1-202-304-1200 (available 7 days a week, 3 pm – 10 pm ET, 12 pm – 7 pm PT)

Veterans' Suicide Prevention Lifeline: 1-800-273-TALK (1-800-273-8255).
https://988lifeline.org/help-yourself/veterans/

SAMHSA Treatment Referral Hotline (Substance Abuse): 1-800-662-HELP (1-800-662-4357).
https://www.samhsa.gov/find-help/national-helpline

National Sexual Assault Hotline: 1-800-656-HOPE (1-800-656-4673).
https://ohl.rainn.org/online/

Loveisrespect (National Dating Abuse Helpline): Call 1-866-331-9474 (TTY: 1-866-331-8453). Text LOVEIS to 22522 - you'll receive a response from a peer advocate prompting you for your question. Go ahead and text your comment or question and we will reply.
http://www.loveisrespect.org/

Survivor Advocacy Program: Call 520-621-5767 or email survivoradvocacy@email.arizona.edu. The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.
https://survivorsupport.arizona.edu/

Subject to Change Statement:
Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor; see http://policy.arizona.edu/faculty-affairs-and-academics/course-syllabus-policy-undergraduate-template.

COURSE SYLLABUS NSCS 200 Spring 2024

Course Title and Number:
Fundamentals of Neuroscience and Cognitive Science (NSCS 200)

Description of Course:
Fundamental concepts in the development, evolution, organization and function of neural circuits underlying behavior, including biological, ethological, computational and psychological perspectives. The course will provide an introduction to the principles of neuroanatomy, neurophysiology and cognitive science. Topics will be addressed with material from philosophy, psychology, computer science and neuroscience, and will incorporate data from work with animals, humans and machines.

Locations and Times:
T, Th 11:00 – 12:15 Room 211, Education Bldg (1430 E. 2nd St.)

Instructor Information:
Dr. Julie E. Miller, Ph.D. (Associate Professor, Neuroscience & Speech, Language and Hearing Sciences)
E-mail address: juliemiller@email.arizona.edu
Office hours: Mondays, 4-5pm and by appointment (see zoom link on D2L)

Mr. James Smith (Senior Ph.D. student, Psychology/Cognitive Science)
E-mail address:jsmith62@arizona.edu
Office hours: Mondays, 3-4pm and by appointment (see zoom link on D2L)

Teaching Assistant:
Israel Aispuro (Neuroscience Ph.D.): israelaispuro12@arizona.edu

Preceptors:
Luciana Antezana Delgado (track: Neuroscience, emphasis: Neurobiology)
lantezanadelgado@arizona.edu
Kylie Morgan (track: Neuroscience, Neurobiology)
kyliemorgan@arizona.edu
Lordess Shukair (track: Neuroscience, emphasis: Neurobiology)
lordeesss@arizona.edu
Itzi Valenzuela (track:Neuroscience, emphasis: Neurobiology)
Ivalenzuela1@arizona.edu
Meghana Warrier (track: Neuroscience, emphasis: Neurobiology)
meghanawarrier@arizona.edu

Office Hours for TAs/Preceptors: To be announced during each unit and by appointment. To schedule a time to meet with a preceptor/TA, email them.

Course Website: All information about the course, including the syllabus, additional reading materials and lecture slides will be available on the D2L website. It is your responsibility to check the course website regularly for announcements and other important course information.

Course format:

This course will be taught in person with lectures also recorded via Panopto. Lecture slides will be posted to D2L before class, and lectures will be recorded and available via Panopto after the lecture.

Course Objectives and Expected Learning Outcomes:

This course is intended to provide a rigorous introduction to topics fundamental to modern brain and cognitive science. Topics range from the cellular and molecular principles necessary to understand normal brain function and clinical disorders, to the approaches of cognitive science that provide a clearer understanding of complex human behavior. This course serves as the initial required course for the Neuroscience and Cognitive Science (NSCS) undergraduate major.

Learning Outcomes:

Upon completion of this course, students should be able to:

1) Describe the general organization of the brain and its relation to physiological and cognitive processes. Explain the fundamental principles of anatomical and functional organization of neuronal circuits and networks underlying the complex capacities of the mind. (NSCS Program Learning Objective A1)
2) Explain, including diagrams, the basic molecular and cellular mechanisms underlying neural excitability and synaptic physiology and predict the consequences of disrupting various elements of the underlying mechanisms. (A2)
3) List and explain several common principles of sensory processing across modalities, describe the basic features of the motor system, and explain how sensory-motor signaling operates. (A3)
4) Summarize contemporary understanding of the biological bases of and the cognitive processes underlying behavior, including sensation, perception, language, learning, and memory. (A6)
5) Describe the basic cognitive processes and primary circuitry involved in language, decision-making, thinking/reasoning, motivation, emotion, and consciousness. Give examples of normal range of cognitive, emotional and behavioral variability over the lifespan. (A7)
6) Outline evolutionary principles that support use of animal model systems and explain how innate/genetic factors and environment/experience are understood to interact in development. (A8)
7) List the basic steps in establishing the wiring plan of the nervous system, including common molecular signaling pathways. Differentiate activity-independent and -dependent steps. (A9)
8) Describe the cognitive, genetic, molecular, and cellular bases of several common diseases and disorders of the nervous system. Discriminate among these disorders in terms of their presentation and include the clinical tools typically used in diagnosis. (A10)
9) At a fundamental level, explain the common methodologies and experimental designs used in research in neuroscience and cognitive science. Evaluate the soundness of the methodological design of descriptive, correlational, and experimental research. Design, interpret, and evaluate simple cognitive, behavioral, and cellular experiments. (A11)

Prerequisites: In progress or completed Psych 150A, MCB 181 (or PSIO 201 or 202 instead of MCB 181). Instructors also have discretion to waive requirements based on review of prior classes taken other than those listed.

Honors Credit:
There is no honors credit offered for this course.

Course Communications:
Announcements will be posted at the beginning of each lecture and on D2L. Students are responsible for staying up-to-date on these announcements. We will also email students to reinforce some announcements.

Textbooks and other Readings:
There is no required textbook to purchase for this course, but we will post articles of interest to D2L if students want to follow up on a particular topic. Tests will be based entirely on content presented in the lectures and may include that from discussion activities. Lecture slides will be posted on the D2L site, and students should take careful lecture notes. Students interested in reading beyond this content can consult any introductory Neuroscience or Cognitive Science book. We particularly recommend the following:

1) Bear MF, Connors BW and Paradiso MA, *Neuroscience Exploring the Brain,* 3rd-4th edition, Wolters Kluwer
2) Watson, NV and Breedlove MC, *The Mind's Machine, Foundations of Brain and Behavior,* 2nd ed. Sinauer Associates, Inc.
3) Goldstein B, *Cognitive Psychology: Connecting Mind, Research, and Everyday Experience*" 4th Edition. Cengage Learning
4) Ward, J. (2015). *The Student's Guide to Cognitive Neuroscience.* (3rd ed.) London: Psychology Press.

A useful web site for enhancing your understanding of cellular neurophysiology using simulations (resting membrane potentials, action potentials) may be found at this free neuroscience online resource:
https://nba.uth.tmc.edu/neuroscience/
General JOVE videos: https://www.jove.com/science-education-library/5/neuroscience

Primary publications and website suggestions related to the lectures will be available on the D2L course site.

Schedule of Topics

DATE	TOPIC	INSTRUCTOR
11-Jan	Introductions, Course Overview, Syllabus	JEM/JS
16-Jan	Intro to Neuronal Structure & Function	JEM
18-Jan	Neuronal Membrane Biophysics I: Resting Potential	JEM
23-Jan	Neuronal Membrane Biophysics II: Action Potential	JEM
25-Jan	Synaptic Transmission: Chemical & Electrical	JEM
30-Jan	Synaptic Transmission/Spinal Cord	JEM

1-Feb	Spinal Cord & Brain Anatomy	JEM
6-Feb	**EXAM 1**	JEM
8-Feb	Intro to Cognitive Science / Methodology	JS
13-Feb	Vision	JS
15-Feb	Hearing	JS
20-Feb	Taste & Smell	JEM
22-Feb	Motor Systems	JEM
27-Feb	Motor Systems in Disease	JEM
29-Feb	**EXAM 2**	JEM/JS
	SPRING BREAK 3/2-3/10	
12-Mar	Consciousness	JS
14-Mar	Attention	JS
19-Mar	Memory I	JS
21-Mar	Memory II	JS
26-Mar	Cellular Plasticity and Learning/Memory	JEM
28-Mar	Cellular Development	JEM
2-Apr	**EXAM 3**	JS/JEM
4-Apr	Neural Control of Speech	JEM
9-Apr	Language and Concepts	JS
11-Apr	Emotion	JS
16-Apr	Executive Function	JS
18-Apr	Decision Making	JS
23-Apr	Cognitive Development	JS
	*** NSCS in the News Writeup due on D2L 4/24, 11:59pm***	
25-Apr	Exam Review/NSCS in the News Discussions	
30-Apr	NSCS in the News Discussions	
7-May	**EXAM 4 (10:30am)** (**not cumulative**): https://registrar.arizona.edu/final-exams-spring-2024	JS/JEM

Grading Policy:

Point Breakdown:

Exam 1, 2, 3, 4 (Final-not cumulative)	20 points each = 80 points

Discussion Assignments (8@2 pt)	2 points each = 14 points (1 discussion automatically dropped)
NSCS in the News Papers	6 points
Total	**100 Possible Points**

Final Course Grade Assignments:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
E	below 60%

http://catalog.arizona.edu/policy/grades-and-grading-system

*****Please note that grades cannot be negotiated as that would not be fair to the entire class. Any final numerical grades at 0.5 decimal points or less from a new letter grade will be rounded up. For example, an 89.5 will become a 90 (resulting in an A).**

Extra Credit

Students will have the opportunity to earn a one-time 0.5 points of extra credit toward your final grade by attending office hours with any member of the instructional team (instructors, TAs, preceptors). We would like to get to know as many students as possible, and to encourage students to seek assistance with course material, if needed. To facilitate both of these things, we will give students 0.5 point extra credit as a one-time bonus for attending office hours or a meet-and-greet session. We encourage students to attend early in the semester to make the best out of the semester moving forward.

Requests for incompletes (I) and withdrawal (W):

These requests must be made in accordance with University policies which are available at https://catalog.arizona.edu/policy-type/grade-policies

Discussion Activities

Eight times during the semester (**two per unit**) we will shift to interactive discussions or problem set work on topics related to a recent lecture. During these activities, students will discuss topics in small groups during lecture. Each student must submit their own write up on the activity under the 'Assignments' tab in D2L **within three days** for two points participation grade per activity on D2L. One discussion will automatically be dropped for all students regardless of the circumstances (no note needed, etc).

"Neuroscience in the News" Write-up and Discussion -- Mandatory (6 points)

During the last two classes of the semester (4/25, 4/30), we will reflect upon the topics covered throughout the course by turning to recent scientific findings highlighted in news/media outlets. You will be required to search for and select one primary research publication related to a topic covered in this course (of your choosing) and prepare at least a 1.5 page, double spaced write-up due by 11:59pm 4/24/24 to D2L. The primary research article must have been published in the last five years (2019 or later). In your write-up, you should 1) describe the scientific finding highlighted by the article, 2) explain how the finding is related to material discussed in NSCS 200, and 3)

evaluate / critique the article by considering the following questions: What do you see as the article's main strengths? Why, or why not, do you think the finding is important? Are there any limitations? The write-up must be in your own words. During class, you will discuss your chosen articles in small groups, and volunteers will be given a few minutes to highlight one article to the class. Students will receive 6 pts for complete answers to these questions in their write-up. *Note that students are responsible for making sure that their "Neuroscience in the News" writeups are uploaded correctly to D2L in Word or pdf form (no Pages or Google docs). **No credit will be given for documents that are not converted or uploaded properly.**

Assignment/Testing Schedule/Due Dates:
Number of required exams: 4 (see dates above): closed book in class via D2L
Number of Discussion Assignments: 8 (each discussion announced that day in class; one dropped)
NSCS in the News Paper: 1
Readings: optional textbooks; selected chapters/articles provided on D2L
Required extracurricular activities: None
Extra credit: 0.5 points, just once: Attend office hours with Dr. Miller, Dr. Andrews-Hanna, or TAs/preceptors.

Attendance Policy:
Class attendance will not be graded. We very much recommend attending the in-person version of the lectures if you are healthy, and using the Panopto-recorded video lectures (see Class Recordings below) when necessary or to review lecture material. Many lectures will have class activities including small-group discussions that are relevant to the material and exams.

Incompletes (I) and withdrawal (W):
Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at
http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete

Absences:
Please notify your instructor if you have an emergency situation that prevents you from submitting work on time and would like to request an extension of the due date. If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office:
DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable,
https://policy.arizona.edu/human-resources/religious-accommodation-policy
Make up exams will only be allowed in cases of a Dean's excuse or emergencies, with advanced approval of instructors. The make-up exam may involve additional components, such as additional questions and/or an oral component. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class activities, please contact us as soon as possible as per the policies above.

Safety on Campus and in the Classroom:
For a list of emergency procedures for all types on incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview (link is external).

Also watch the video available at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy000000000003560

UA Academic policies and procedures:

https://academicaffairs.arizona.edu/syllabus-policies

Accessibility and Accommodations:
At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (DRC, 520-621-3268, https://drc.arizona.edu/) to establish reasonable accommodations. The **DRC is designated by the institution to ensure access for disabled students and employees.** As such, all disability documentation and requests for accommodations must be handled by DRC. Students can affiliate with DRC through an online process. Our Access Consultants work with students and collaborate with instructors and colleges regarding reasonable accommodations and DRC's processes.

Student Assistance:
https://deanofstudents.arizona.edu/support/student-assistance

Academic Advising:
If you have questions about your academic progress this semester, please reach out to your academic advisor (https://advising.arizona.edu/advisors/major). Contact the Advising Resource Center (https://advising.arizona.edu/) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@arizona.edu

Code of Academic Integrity:
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials with each other. **However, graded work/exercises must be the product of independent effort unless otherwise instructed**. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog.
See: https://deanofstudents.arizona.edu/policies/code-academic-integrity
The University Libraries have some excellent tips for avoiding plagiarism:
https://new.library.arizona.edu/research/citing/plagiarism

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA email to sell or buy these copyrighted materials are

subject to Code of Conduct Violations for misuse of student email addresses. This conduct may also constitute copyright infringement.

Classroom Behavior Policy:
To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed.
The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See https://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students

Nondiscrimination and Anti-Harassment Policy: The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy **(link is external).**

Statement of Copyrighted Materials:
Students are advised that all course materials disseminated by the instructor to the students, whether in-class or online (i.e. D2L), are original materials and as such, reflect intellectual property of the instructor or author of those works. Any notes and handouts are intended for individual use by the student. Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

Confidentiality of Student Records:
https://registrar.arizona.edu/privacy-ferpa/ferpa-compliance

University-wide Policies link: http://catalog.arizona.edu/syllabus-policies

Class Recordings:
The class will not be live-streamed, but we will aim to record each lecture in Panopto, which will be uploaded to D2L → Panopto tab for later viewing. For lecture recordings, students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies Code of Academic Integrity (https://deanofstudents.arizona.edu/policies/code-academic-integrity) and Student Code of Conduct (https://deanofstudents.arizona.edu/student-rights-responsibilities/student-code-conduct) are also subject to civil action.

UA Academic policies and procedures:
https://academicaffairs.arizona.edu/syllabus-policies

Land Acknowledgement:
We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service. For more information about the native lands on which UArizona sits, see nasa.arizona.edu.

Commitment to Diversity, Inclusion, and Respect:
Diversity unites and moves us forward. The diverse backgrounds, experiences and perspectives that each student brings to this class will be viewed as a resource, strength, and benefit. In this class, we have a unique and important opportunity to learn from the information and ideas shared by each other, and we also a responsibility to do so with sensitivity and respect.

Ideally, science would be objective. However, as you will learn, much of science is subjective and is historically built on a small subset of privileged voices. It is important to make note of this and to think about how significant research findings may be biased by their nature of being carried out on a typically small, non-representative sample of participants.

We would like to create a learning environment for my students that honors diverse identities (including race, ethnicity, gender, age, class, sexuality, nationality, religion, ability, etc.), and supports a diversity of experiences, thoughts, and perspectives. To learn more about the UA's commitment to diversity, and inclusion, please visit https://diversity.arizona.edu/ The University is also committed to creating and maintaining an environment free of discrimination; see https://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy. Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Preferred Name and Pronouns: This course affirms people of all gender expressions and gender identities. The university recognizes that many members of its community use names other than their legal or official names first provided to the university (official/legal name) to identify themselves. For some, a chosen or preferred name may be an important component of their identity, especially their gender identity.

If you would prefer that a different name from your legal one or the one that appears on the class roster be used, the university has established guidelines that allow students and employees to indicate their chosen or preferred first names. A student or employee's preferred name will appear instead of the person's official/legal name in select university-related systems and documents (e.g. D2L, official email display name, UAccess, etc.), provided that the preferred first name is not being used for the purpose of misrepresentation. Please see the following link for more information: https://lgbtq.arizona.edu/use-chosen-or-preferred-names

We want to be sure that we refer to you in your preferred way. If you prefer a name other than the one on our class roster, please let us know. If you have certain pronouns that you want us to use, please include them when you sign your email. We will try our best to remember your preferred names and pronouns, but please also feel free to give us a reminder. Also, students are able to update and edit their pronouns in UAccess. To change your listed pronoun on UAccess, navigate to the Student Self Service page, go to the personal information section, and click on "Names". Options include (he, him, his), (she, her, hers), (they, them, theirs), (xe, xem, xyr), and (ze, zir). More information on updating your preferred name and pronouns is available on the Office of the Registrar site at https://www.registrar.arizona.edu/ and https://lgbtq.arizona.edu/students.

Additional Resources for Students:

Service Members and Veterans:
If you are a current service member or veteran reach out to the VETS center. VETS is an organization run by veterans, spouses, dependents, and current service members who, through their shared experiences, endeavor to maintain a dynamic and effective program which is responsive to the needs of the community. More information can be found at https://vets.arizona.edu.

Basic Needs Statement:
Basic needs insecurity affects 1 in 3 college students at the University of Arizona, which can impact students both inside and outside of the classroom and affect their opportunity to learn. Any student who has difficulty accessing sufficient food, clothing, and hygiene items or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries and the Campus Closet is available for free clothing items. For all information about on-campus and off-campus resources, please visit https://asuatoday.arizona.edu/basic-needs.

Mental Health Resources:
Personal concerns such as stress, anxiety, depression, attentional difficulties, relationship difficulties, etc. can interfere with your ability to succeed and thrive at the University of Arizona. UA has assembled an excellent set of health-related resources at https://health.arizona.edu. For helpful links to mindfulness exercises, free mental health apps, mental health groups, and other tools to help cope with stress, click on the "Support Your Mental Health" link in this webpage: https://health.arizona.edu/take-charge-your-well-being-2021.

For UA's Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334. Relatedly, if you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office's Student Assistance Program helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services. https://deanofstudents.arizona.edu/support/student-assistance
Email: DOS-deanofstudents@email.arizona.edu (link sends e-mail) Phone: 520-621-7057

Are you in crisis? Here are some ideas about where to go or who to call:

Located in Tucson? Call the Community-Wide Crisis Line 24 hours a day, 7 days a week at 520-622-6000. https://www.namisa.org/crisis-line/

Are you a University of Arizona student? If it is not an emergency and you are a UA student, call or walk-in to Counseling and Psych Services at 520-621-3334 Monday - Friday. Walk-in triage is available between 9 am and 4 pm Monday - Friday.

Are you a concerned friend? Concerned friends can find out more about helping a friend who might be experiencing problems through our Friend 2 Friend website: https://friend2friend.arizona.edu/

Resources for sexual assault, relationship violence, and stalking: The UA CAPS Oasis Sexual Assault and Trauma Services (Oasis) can be reached at 520-626-2051. https://survivorsupport.arizona.edu

24-Hour Hotlines:

The National Suicide Prevention Lifeline is a 24-hour, toll-free, confidential suicide prevention hotline available to anyone in suicidal crisis or emotional distress. By dialing 1-800-273-TALK (8255), the call is routed to the nearest crisis center in our national network of more than 150 crisis centers. The Lifeline's national network of local crisis centers provides crisis counseling and mental health referrals day and night. https://988lifeline.org/

Crisis Text Line: Text HOME to 741741 from anywhere **in the United States**, anytime, about any type of crisis. A live, trained Crisis Counselor receives the text and responds, all from a secure online platform. Find out more about how it works at https://crisistextline.org

Suicide Prevention for LGBTQ Youth through the Trevor Project (https://www.thetrevorproject.org/get-help/#sm.0000n8i5bxqvkcwf10zbfu33lvh1r)

- The Trevor Lifeline is a 24/7 suicide hotline: 866-4-U-TREVOR (1-866-488-7386)
- TrevorChat: Online instant messaging available 7 days a week, 3 pm – 10 pm ET (12 pm – 7 pm PT)
- TrevorText: Confidential and secure resource that provides live help for LGBTQ youth with a trained specialist, over text messages. Text TREVOR to 1-202-304-1200 (available 7 days a week, 3 pm – 10 pm ET, 12 pm – 7 pm PT)

Veterans' Suicide Prevention Lifeline: 1-800-273-TALK (1-800-273-8255). https://988lifeline.org/help-yourself/veterans/

SAMHSA Treatment Referral Hotline (Substance Abuse): 1-800-662-HELP (1-800-662-4357). https://www.samhsa.gov/find-help/national-helpline

National Sexual Assault Hotline: 1-800-656-HOPE (1-800-656-4673).
https://ohl.rainn.org/online/

Loveisrespect (National Dating Abuse Helpline): Call 1-866-331-9474 (TTY: 1-866-331-8453). Text LOVEIS to 22522 - you'll receive a response from a peer advocate prompting you for your question. Go ahead and text your comment or question and we will reply.
http://www.loveisrespect.org/

Survivor Advocacy Program: Call 520-621-5767 or email survivoradvocacy@email.arizona.edu. The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.
https://survivorsupport.arizona.edu/

Subject to Change Statement:

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor; see http://policy.arizona.edu/faculty-affairs-and-academics/course-syllabus-policy-undergraduate-template.

March 12, 2024

NROS 305 Genetics & Genomics in Neuroscience
Course Syllabus
(Time & Location TBA)

Description of Course
Genetics and genomics are central to contemporary Neuroscience. Genetics is the study of genes, the molecular mechanisms of gene action, genetic variations in health and disease, and inheritance. Genes contain the information needed to specify physical and behavioral traits and provide the basis of inheritance for all life forms, from bacteria to humans. Genomics is the study of all genes of an organism (the genome) and the interactions of genes with each other and with the organism's environment.

This 3-unit course will discuss the nature of genes and genomes, their regulation, and inheritance; how changes in the genetic information can lead to dysfunction and disease or benefit survival; how internal or external cues are memorized by genomes and shape gene expression; how genes and genomes are studied, and how genetic technologies are used to manipulate gene or genome function and explore how they are used for the analysis of a wide range of neurobiological mechanisms in health and disease.

Course Prerequisites
MCB 181 R/L, Introductory Biology I and Laboratory
CHEM 151, General Chemistry I; CHEM 152, General Chemistry II
CHEM 241A and CHEM 241B, Organic Chemistry I and II are recommended

Instructors & Contact Information
Konrad E. Zinsmaier, Ph.D.
Department of Neuroscience and Molecular & Cellular Biology
office: Gould Simpson Bldg., Room 627
email: kez4@arizona.edu

Office Hours
Date and Location, TBA

Preceptors
TBA

Teaching Assistants (TAs)
TBA

Web Information
Course home page: D2l, https://d2l.arizona.edu/d2l
Instructor home page: https://neurosci.arizona.edu/person/konrad-zinsmaier-phd

Course Format
Lectures, in-class discussions, in-class exercises, and web-delivered content or assessments.

Course meeting times and location
This class will be taught in person: TBA
Discussion section (optional): TBA

Course Objectives
The overall objective of this course is to provide students with a solid basic understanding of genetics and genomics, and to highlight selected challenges of genetics critical for society. The course emphasizes up-to-date concepts of contemporary genetics rather than excessive detail. Students will develop problem solving skills as the course guides students to think analytically to apply and extend their knowledge of genetics.

The specific objectives of this course are to provide students with a solid understanding of the concepts underlying:

- the nature, action, variation, and inheritance of genetic material;
- the molecular mechanisms linking genotype and phenotype;
- the mechanisms underlying gene expression and gene regulation;
- the latest genetic technologies to manipulate genes and genomes;
- and the genetic mechanisms underlying simple and complex neurological, neurodegenerative, and neuropsychiatric diseases.

Expected Learning Outcome

By the end of the semester, you will be able to:

- use human pedigrees to predict patterns of inheritance and calculate the probability of disease;
- apply concepts of molecular genetics, classical genetics, and epigenetics to dissect molecular pathways and the functional relationships between gene products;
- apply modern genetic techniques to manipulate genes and genomes for the study of the brain and other applications;
- apply genetic concepts to animal models of simple and complex neurological, neurodegenerative, and neuropsychiatric diseases/disorders;
- evaluate ethical problems in genetic testing, gene editing and treatment of human disease.

Makeup Policy for Students Who Register Late

Students who register after the first class or later must make up missed assignments/quizzes within 2 weeks of being enrolled in the class. Please, consult the instructor for any problems with this policy.

Required Textbook and Other Learning Resources

1. Required Textbook: *Essentials of Genetics* by Klug, Cummings, Spencer, Palladino, and Killian published by Pearson Education, 10th Edition. The digital copy is preferred and will be used in combination with the online learning systems *Mastering Genetics* and *Learning Catalytics*.
2. Mastering Genetics: a digital online tutorial linked to the digital textbook. It is used to practice what has been taught in class, homework assignments and quizzes.
3. Learning Catalytics: a digital online platform linked to the digital textbook is used for in-class exercises.
4. Additional Reading and Learning Material: Material covering special topics will be made available on the D2L website of the course.

All course materials are being delivered digitally via D2L through the *Inclusive Access* program of the University Bookstore.

Access to all course materials is FREE through TBA. You must take action (even if you have not accessed the materials) to opt-out if you do not wish to pay for the materials, which is not recommended.

Access to Mastering Genetics and Learning Catalytics is essential for completing Homework Quizzes and in class exercises. The deadline to opt-out is TBA.

Please access the material through D2L on the first day of class to make sure that there are no issues with content delivery. You can find instructions on how to access these materials in the content section of the D2L site in the file “Accessing Course Materials”.

If you do not opt-out and choose to retain your access, the cost of $ TBA for the digital course materials will appear on your Bursars account. Please refer to the Inclusive Access FAQs at https://shop.arizona.edu/textbooks/Inclusive.asp for additional information.

Required Equipment and Software

For this class you will need access to the following hardware: computer or web-enabled device to access D2L, Learning Catalytics, Mastering Genetics and other course materials; regular access to reliable internet signal; ability to download and run the following software: Adobe Acrobat, Word, or other text software.

Assignments and Exams

A. Exams – 480 points. There will be a total of 3 non-cumulative mid-term exams and an optional final exam to be taken in person. Each exam is worth 160 points (16% of final grade; total exam grade is 48% of final grade). Info on the schedule of the optional final exam and the final exam regulations can be found at: https://registrar.arizona.edu/finals.

A cumulative final exam is optional and will be given during the final exam period. This exam is available to students who would like to replace a low grade on one of their 3 mid-term exams with the grade of the final exam.

Because exams contain extra credit questions, they are generally not curved. Should the instructor decide to apply a curve to an exam, the grade will be adjusted such that the average of the top 5% of grades equals 160 points. For example, if the average of the top 5% of raw grades is 149, then your adjusted grade will be your raw exam grade plus 11.

B. Mastering Genetics, Dynamic Study Modules (DSMs) – 120 points. 12% of the final grade is determined by completing 12 out of the 13 weekly online Dynamic Study Modules in Mastering Genetics, each worth 10 points. DSMs are overall reviews of each chapter's material, which students have indicated are extremely helpful in learning the information. Full points are awarded upon completion before the due date. There is no penalty for using hints or multiple attempts.

C. Mastering Genetics, Quizzes – 300 points. There are 12 weekly online quizzes in Mastering Genetics worth 10 points each. Quizzes are generally available one week prior to their due date. The average score of all quizzes is worth 30% of the final grade.

You will be allowed two attempts, with your best score being recorded. Late work will be accepted up to one week after the due date, with a deduction of 15%.

Please note that Mastering Genetics grades on a question-by-question basis, so all questions answered correctly before the due date will receive full credit. Questions answered after the due date will receive a 15% reduction for each day late.

D. Learning Catalytics, in-class exercise – 100 points. 10% of the final grade is determined by participation in problem-solving via Learning Catalytics and worksheets during class. There are 24 in-class exercises, each worth 5 points. Students need to complete a minimum of 20 problem-solving exercises. For students who complete more than 20 exercises, the 20 best scores will be used to calculate the final grade.

Final Examination

The date and time of the optional final exam, along with a link to the Final Exam Regulations and Final Exam Schedule, can be found at: https://registrar.arizona.edu/finals.

Grading Policy

Assignment	Points each	Total Points	% Total Grade
Exam 1	160	160	16%
Exam 2	160	160	16%

Exam 3	160	160	16%
Exam 4 (optional final exam)	160		(16%)
In-Class Exercises, Learning Catalytics (20/24)	5	100	10%
Quizzes, Mastering Genetics (12/12)	25	300	30%
Dynamic Study Modules, MG (12/13)	10	120	12%
Total Possible Points		***1000***	***100%***

Final letter grades are based on the following scale:

90-100%	A
80-90%	B
70-80%	C
60-70%	D
Below 60%	E

University policy regarding grades and grading systems is available at:
http://catalog.arizona.edu/policy/grades-and-grading-system

Requests for incompletes (I) and withdrawal (W) must be made in accordance with university policies, which are available at:
http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and
http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal, respectively.

Grades of Incomplete ("I") will be awarded only at the end of the semester and not on account of disappointing performance. Students who are doing poorly in the course should drop it or withdraw (taking a grade of "W") before the UA deadlines for those actions. Requesting "W" grade after the deadline will require a petition to the Dean for approval.

Regrading Policy
If you believe that there has been an error in grading of an assignment, quiz, or exam, please contact the instructor who will review the material in question. You must initiate a request for re-grading within 2 weeks of the date on which the grade was posted; otherwise, we will not consider the request. Requests must be sent electronically with a coherent justification for why more points should be given.

Assignment due dates and test schedule
A detailed course schedule, including due dates for assignments and dates of exams, is found on our course D2L site. You will be required to complete homework quizzes and reading assignments on your own time.

Academic advising
If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

Attendance Policy
Attendance is required for all sessions except:

- All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion.
- Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Make-up exams or quizzes require approval and will only be allowed in cases of well-documented emergencies. Make up exams or quizzes will be modified from the original.

Notify me (kez4@arizona.edu) if you will be missing an in-person session, or if you will miss an assignment deadline.

- Non-attendance for any reason does not guarantee an automatic extension of due date or rescheduling of examinations.
- Please communicate and coordinate any request directly with me (kez4@arizona.edu).

Classroom attendance

- If you feel sick, or if you need to isolate or quarantine based on University protocols, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify your instructor(s) if you will be missing a course meeting or an assignment deadline.
- Non-attendance for any reason does **not** guarantee an automatic extension of due date or rescheduling of examinations/assessments.
- Please communicate and coordinate any request directly with your instructor *(kez4@arizona.edu)*.
- If you must miss the equivalent of more than one week of class, please contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
- Voluntary, free, and convenient COVID-19 testing is available for students on Main Campus.
- If you test positive for COVID-19 and you are participating in on-campus activities, you must report your results to Campus Health. To learn more about the process for reporting a positive test, visit the Case Notification Protocol.
- The COVID-19 vaccine and booster is available for all students at Campus Health.
- Visit the UArizona COVID-19 page for the most up-to-date information

Student Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, students are expected to adhere to the UA *Code of Academic Integrity.* Graded work (exams and quizzes) must be the product of independent effort unless otherwise instructed. The policies related to issues like cheating and plagiarism will be strictly enforced. Read the full Code at https://deanofstudents.arizona.edu/student-rights-responsibilities/academic-integrity

Classroom Behavior and Classroom Policies Regarding Effective Learning

Individuals in groups can learn best when all are considerate of each other. Therefore, we ask that you please make every effort to make the environment in the classroom conducive to effective learning. This includes such things as turning off your cell phone, only using your laptop for class related activities, refraining from conversation that is not geared toward the topic of the day, arriving on time, and leaving when class is finished. Read the full *Student Code of Conduct* at http://deanofstudents.arizona.edu/studentcodeofconduct

Principle (from the above website). Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. This principle is furthered by the student Code of Conduct and disciplinary procedures established by ABOR Policies 5-308 - 5-403, all provisions of which apply to all University of Arizona students. This Code of Academic Integrity (hereinafter "the Code") is intended to fulfill the requirement imposed by ABOR Policy 5-403.A.4 and otherwise to supplement the student Code of Conduct as permitted by ABOR Policy 5-308.C.1. When you sign your name to your work, you are signing that it is solely your work.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy. Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those

opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Policy against Threatening behavior
The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self.

University of Arizona policies apply and can be found in the following website: http://policy.web.arizona.edu/~policy/threaten.shtml.

Notification of Objectionable Materials
This course may contain material that may be deemed offensive by some students. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Accessibility and Accommodations
At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, drc.arizona.edu) to establish reasonable accommodations.

Gender Pronoun
It is already UA policy that class rosters are provided to instructors with a student's preferred name. Students may share their preferred name and pronoun with members of the teaching staff and fellow students, as desired, and these gender identities and gender expressions will be honored in this course. As the course includes group work and in-class discussion, it is critical to create an educational environment of inclusion and mutual respect. In this class, to be inclusive of all gender identities and expressions, students will be referred to by their first or last names, the pronoun of their choice, or by default, the pronoun "they".

Confidentiality of Student Records
See http://www.registrar.arizona.edu/ferpa/default.htm

Life challenges
If you are experiencing unexpected barriers to your success in the courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges
If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Safety on Campus and in the Classroom
For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview.

Also watch the video available at
https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy0000000000003560

NROS 305 Genetics & Genomics in Neuroscience
Course Schedule

Abbreviations: Dynamic Study Modules (DSM, tutorials and problems) ; Mastering Genetics (MG, tutorials, problems, quizzes); Learning Catalytics (LC, problem solving in-class exercises)

Session 1 **Course Overview & Introduction to Genetics**
- Readings: Chapter 1, p 1-11)

Weekly assignments
- DSM 1: selected introduction tutorials
- MG: Introduction/Practice

Session 2 **Mitosis**
- Readings: Chapter 2, p. 12-21
- In-class exercise (LC 1): selected question mitosis

Session 3 **Meiosis**
- Readings: Chapter 2, p. 22-27
- Special topic discussion: Down Syndrome (trisomy 21)
- In-class exercise (LC 2): selected questions meiosis
- In-class exercise & discussion: PubMed: Exploring and Retrieving Biomedical Literature

Weekly assignments:
- DSM 2: selected Chapter 2 tutorials
- MG Quiz 1: selected questions Chapter 2

Session 4 **Mendelian Genetics**
- Readings: Chapter 3, p. 32-39; 41-42
- In-class exercise (LC 3): selected questions: Mendel's principles
- In-class exercise & discussion: Online Mendelian Inheritance in Man (OMIM)

Session 5 **Statistical Analysis of Genetic Data & Pedigrees**
- Readings: Chapter 3, p. 42-48
- Special topic discussion: Tay-Sachs Disease (a monogenetic disorder)
- In-class exercise (LC 4): selected questions Chi Square Analysis

Weekly assignments:
- DSM 3: selected Chapter 3 tutorials
- MG Quiz 2: selected questions Chapter 3

Session 6 **Dominance, Multiple Alleles & Complementation Test**
- Readings: Chapter 4, p. 53-66
- Special topic discussion: Dominant Disorders in Humans
- In-class exercise (LC 5): selected questions complementation test

Session 7 **Sex-linked & Extranuclear Inheritance, Penetrance & Expressivity of Mutations**
- Readings: Chapter 4, p. 66-75
- Special topic discussion: Sex-linked Disorders in Humans
- In-class exercise (LC 6): selected questions sex-linked inheritance, reduced penetrance

Weekly assignments:
- DSM 4: selected Chapter 4 tutorials
- MG Quiz 3: selected questions Chapter 4

Session 8 **Sex Determination, & Sex Chromosomes**
- Readings: Chapter 5, p. 83-94
- In-class exercise & discussion: Genetics, Ethics, and Society: Sex Selection in Humans
- In-class exercise (LC 7): selected questions sex determination

Session 9 **Chromosome Mutations: Variations in Number and Structure**
- Readings: Chapter 6, p. 99-116
- In-class exercise: Chromosomal Aberrations Worksheet
- Special topic discussion: Fragile-X Syndrome
- In-class exercise (LC 8): selected questions chromosomal rearrangements

Weekly assignments:
- DSM 5: selected Chapter 6 and 7 tutorials
- MG Quiz 4: selected questions Chapter 6-7

Session 10 **Exam 1 (Chapters 2-9)**

Session 11 **Gene Linkage, Crossover & Chromosome Mapping**
- Readings: Chapter 7, p. 121-138
- In-class exercise (LC 9): selected questions chromosome mapping
- In-class exercise & discussion: Exploring Genomics: Human Chromosome Maps on the Internet

Weekly assignments:
- DSM 6: selected Chapter 7 tutorials

Session 12 **DNA/RNA Structure and Analysis**
- Readings: Chapter 9, p. 162-178
- In-class exercise (LC 10): selected questions DNA/RNA structure
- In-class exercise & discussion: Introduction to Bioinformatics: BLAST

Session 13 **DNA Replication**
- Readings: Chapter 10, p. 183-199
- Special topic discussion: Telomeres & Aging
- In-class exercise (LC 11): selected questions replication fork activity

Weekly assignments:
- DSM 7: selected Chapter 9 and 10 tutorials
- MG Quiz 5: selected questions Chapter 9 and 10

Session 14 **Organization of DNA and Genomes**
- Readings: Chapter 11, p. 202-214
- In-class exercise: Database of Genomic Variants: Structural Variations in the Human Genome
- In-class exercise (LC 12): selected questions chromatin organization

Session 15 **The Genetic Code**
- Readings: Chapter 12, p. 219-228
- In-class exercise: Database of Genomic Variants: Structural Variations in the Human Genome
- In-class exercise (LC 13): selected questions genetic code

Weekly assignments:
- DSM 8: selected Chapter 10 and 11 tutorials
- MG Quiz 6: selected questions Chapter 10 and 11

Session 16 **RNA Transcription & mRNA Splicing**
- Readings: Chapter 12, p. 229-236
- Special topic discussion: Treating Spinal Muscular Atrophy
- In-class exercise (LC 14): selected questions transcription and mRNA splicing

Session 17 **Protein Translation**
- Readings: Chapter 13, p. 241-256
- In-class exercise (LC 15): selected questions protein translation

Weekly assignments:
- DSM 9: selected Chapter 12 and 13 tutorials
- MG Quiz 7: selected questions Chapter 12 and 13

Session 18 **Gene Mutations & DNA Repair**
- Readings: Chapter 14, p. 260-280
- Special topic discussion: Retrotransposons in Humans
- In-class exercise (LC 16): selected questions mutations & DNA repair
- In-class exercise:

Session 19 **Regulation of Gene Expression in Eukaryotes (I)**
- Readings: Chapter 16, p. 303-310
- Special topic discussion: Epigenetics versus Genetics
- In-class exercise (LC 17): selected questions regulation of mRNA transcription
- In-class exercise & discussion: Exploring Genomics: Tissue-Specific Gene Expression

Weekly assignments:
- DSM 10: selected Chapter 12 and 13 tutorials
- MG Quiz 8: selected questions Chapter 14 and 16

Session 20 **Exam 2**

Session 21 **Epigenetic Regulation of Transcription**
- Readings: Review: Epigenetic Mechanisms in Memory Formation
- Special topic discussion: Epigenetic Disease: Rett Syndrome

Session 22 **Regulation of Gene Expression in Eukaryotes (II)**
- Readings: Chapter 16, p. 310-318
- In-class exercise (LC 18): selected questions regulation of mRNA splicing, mRNA degradation & protein translation

Weekly assignments:
- DSM 11: selected Chapter 16 tutorials
- MG Quiz 9: selected questions Chapter 16

Session 23 **Recombinant DNA Technologies**
Cloning vectors, DNA libraries, PCR, DNA and RNA Analysis
- Readings: Chapter 17, p. 323-338

- In-class exercise & discussion: Manipulating Recombinant DNA: Restriction Mapping
- In-class exercise (LC 19): selected questions DNA/RNA analysis

Session 24 **Gene Editing Technologies**
Of Knockouts (KOs) & CRISPR
- Readings: Chapter 17, p. 338-342
- Special topic discussion: Ethical issues with gene editing
- In-class exercise & discussion: Designing KO and CRISPR experiments
- In-class exercise (LC 20): selected questions gene editing

Weekly assignments:
- DSM 12: selected Chapter 17 tutorials
- MG Quiz 10: selected questions Chapter 17

Session 25 **Genomics & Bioinformatics**
- Readings: Chapter 18, p. 347-370
- In-class exercise & discussion: Contigs, Shotgun Sequencing, and Comparative Genomics
- In-class exercise (LC 21): selected questions genomics

Session 26 **Population Genetics & the Study of Polygenic Traits**
- Readings: Chapter 21, p. 413-419
- Special Topic: Genetic variation in Humans
- In-class exercise (LC 22): selected questions population genetics

Weekly assignments:
- DSM 13: selected Chapter 18 and 21 tutorials
- MG Quiz 11: selected questions chapters 18 and 21

Session 27 **Polygenic Disease & Genome-Wide Association Studies (I)**
- Readings: Handout
- Special topic discussion: Autism, progress & challenges
- In-class exercise (LC 23): estimating allele frequencies, testing for genetic equilibrium

Session 28 **Polygenic Disease & Genome-Wide Association Studies (I)**
- Readings: Handout
- Special topic discussion: Neuropsychiatric disorders, progress & challenges
- In-class exercise (LC 24): estimating allele frequencies, testing for genetic equilibrium

Weekly assignments:
- MG Quiz 12: selected questions polygenic disease and GWAS

Session 29 **The Challenge for Neurogenetics**
- Readings: Handout
- Special topic discussion: Where we are and where we need to go.

Session 30 **Exam 3**

The information in this course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor. Any changes to the syllabus will be announced in class and posted on the D2L website.

NROS 307: Cellular Neurophysiology
Spring 2024, MWF 9:00-9:50am
McClelland Park Building, Room 105
Marina Cholanian, Ph.D.

Course description
3 credit hours, Spring semester

Fundamental concepts, and the underlying experimental evidence, of cellular neurobiology, including: the structure and biophysical properties of membranes of nerve cells, glia, and muscle cells; the biophysical, molecular and physiological mechanisms underlying information processing and signaling by nerve cells and synapses; and the organization and functioning of neural circuits to form nervous systems.

Lectures are on MWF at 9:00 – 9:50 am in McClelland Park Building, Room 105

Optional discussions with preceptors:
Mondays 10:00-10:50 am in Social Sciences, Room 411 – with Yuki
Wednesdays 1:00pm-1:50 pm in Chavez, Room 308 – with Gabe, Beth, Arian
Thursdays 10:00-10:50 am Social Sciences, Room 308 – with Ivan

Mandatory Honors discussions with TA (these are mandatory for all Honors students):
Fridays 10:00-10:50 am in Social Sciences, Room 411 – with Allie

Course prerequisites
MCB181R & ECOL182, CHEM151/152 with labs.

Instructor
Marina Cholanian, Ph.D.
Assistant Professor of Practice
Department of Neuroscience
Office: Gould-Simpson Building - Room 642
Email: shetka@arizona.edu (will reply within 24 hours M-F)
Office hours: Mondays at 12:15 pm or email for an appointment.

Graduate Teaching Assistant (TA):
Alexandria Ashman, aashman@arizona.edu

Preceptors:
Beth Brooks, bethbrooks2002@arizona.edu
Ivan Carrillo, ivancarrillo@arizona.edu

Gabe Neal, gneal@arizona.edu
Arian Piepho, arianpiepho@arizona.edu
Yuki Seo, yukiseo@arizona.edu

Course website

See D2L website at: https://d2l.arizona.edu

The website will include announcements, assignments, grades, links to required and background reading materials, and slides for all class sessions. Students should check the website regularly.

Course Objectives:

This course focuses on a study of the molecular, biophysical, and neurophysiological mechanisms underlying the generation and propagation of signals within and between neurons and glial cells as well as effector (muscle and gland) cells. The properties of individual neurons will be examined first, followed by a study of how these cells function in circuits. The course will emphasize the importance of experimental data critical thinking, and the use of model systems to understand the functions of cells in and controlled by the nervous system.

Expected Learning Outcomes:

At the completion of this course students are expected to understand:

- the roles of ion channels and other membrane components in generating resting, action, and synaptic potentials
- the properties of different types of ion channels and how those properties can be used to change signaling within neurons
- the mechanisms of neurotransmission at synapses.
- the mechanisms of synaptic integration
- the mechanisms of synaptic plasticity
- interactions between neurons and glial cells and between neurons and effector cells
- neural circuits supporting the functions of visual system

NSCS Learning Objectives. This course contributes to the following learning objectives for the NSCS major (see NSCS website for more details): 3A1, 4A2, 5A2, 17A6, 21A10, 22A10, 36NS12, 37NS12, 38NS13, 39NS13, and 47NS18.

Grading policy

Regular grades are awarded for this course:

90-100% A

80-89% B

70-79% C

60-69% D

0-59% E

Grades of Incomplete ("I") will be awarded only at the end of the semester and **not on account of disappointing performance**. Students who are doing poorly in the course should drop it or withdraw (taking a grade of "W") before the UA deadlines for those actions. Requesting "W" grade after the deadline will require a petition to the Dean for an approval.

Quizzes: Quizzes will be given promptly at the beginning of class on dates indicated in the course schedule (12 quizzes total, lowest 2 dropped), and will be designed to test and consolidate students' understanding of any material covered since the previous quiz, but any previously presented material is a fair game. The quizzes will involve quantitative problem solving as well as analysis and explanation of phenomena in clear, coherent, written English. **No make-up quizzes will be offered.** If you miss a quiz for any reason, whether excused or unexcused, that quiz will be your dropped one (2 will be dropped).

In-Class exercises: There will be in-class exercises that will be completed in class and turned in for credit. There will be no makeup for these exercises except if class was missed for an official excused absence. Each will be worth 5 points. The first 22 will count towards the final grade and the next one will count as extra credit. Any additional exercises will simply count as makeups for any you might have missed.

Exams: There will be four in-class examinations and an optional final exam. A formal final exam will be given during exam period, but it is ***not*** required of students. *It is available for those who would like to replace the grade on one of their four in- class exams with the grade they earn on a formal final exam*. Like the in-class final exam, that final exam given during exam period will cover material from the entire course. It will be no longer than the in-class exams, but students will have 120 min. to complete it.

While all exams will be curved, final class grade ***will not*** be curved. The grade breakdown is as follows:

	Point breakdown
Quizzes (best 10 of 12 will be counted @ 10 pts each)	100
In-class exercises (22 @ 5 pts each)	110
Exam 1	100
Exam 2	100
Exam 3	100
Exam 4	100
Optional Final Exam (*replaces lowest exam score; cumulative)	100
TOTAL POINTS	610

Reading materials (Optional)
Principles of Neuroscience. Kandel et al. (Fifth Edition). ISBN: 978-0-07-139011-8
Other readings will be available from the D2L Website.

Attendance policy
Attendance records will not be collected, but regular attendance in class – and *active participation in discussions* – is considered essential for success in the course.

All holidays or special events observed by organized religions will be honored for students who show affiliation with those religions. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored. **There will be no make-up quizzes. Make-up exams will be approved by Prof. Cholanian only in cases of well-documented emergencies**. Make-up exams will be modified from the original and given as close to the exam date as possible.

Further UA policies

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences . Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Classroom behavior and classroom policies regarding effective learning
Students are expected to adhere to the UA Student Code of Academic Integrity. Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. Graded work/exercises, however, must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity. .

Individuals in groups learn best when all are considerate of each other. Therefore, you are asked to make every effort to make the classroom environment conducive to learning. Please turn off your cell phone, use your laptop computer only for class-related activities, and refrain from conversation that is not focused on the topic of the day. Please also arrive in class on time and do

not leave until class is finished. Read the full UA Student Code of Conduct at: http://dos.web.arizona.edu/uapolicies/scc5308abcd. The Student Code of Conduct prohibits threats of physical harm to any member of the University community, including to one's self. See: http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu) to establish reasonable accommodations.

If you have accommodation requests, please plan to meet with Dr. Cholanian by appointment to discuss the accommodations and how course requirements and activities may impact your ability to fully participate.

Code of Academic Integrity

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Selling class notes and/or other course materials to other students or to a third party for resale is not permitted. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at http://catalog.arizona.edu/2015-16/policies/aaindex.html. Student Assistance and Advocacy information is available at http://deanofstudents.arizona.edu/student-assistance/students/student-assistance.

Subject-to-change statement Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor. Any changes to the syllabus will be announced in class and posted on the D2L website.

Faculty ownership rights in lecture notes and course materials
Course instructors hold the copyright to their lectures, lecture slides, quizzes and exams, and other original course materials. This copyright includes student notes or summaries that substantially reflect the instructors' lectures or materials. These materials are made available only for personal use by students, and *students may not distribute or reproduce the materials for commercial purposes without the instructors' express written consent*. (This does not prevent students from sharing notes on an individual basis for personal use.) Violation of an instructor's copyright may result in course sanctions and violate the Code of Academic Integrity.

Academic advising. If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

Policy against Threatening behavior
The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self.

University of Arizona policies apply and can be found in the following website: http://policy.web.arizona.edu/~policy/threaten.shtml.

Notification of Objectionable Materials
This course may contain material that may be deemed offensive by some students. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Gender Pronoun
It is already UA policy that class rosters are provided to instructors with a student's preferred name. Students may share their preferred name and pronoun with members of the teaching staff and fellow students, as desired, and these gender identities and gender expressions will be honored in this course. As the course includes group work and in-class discussion, it is critical to create an educational environment of inclusion and mutual respect. In this class, to be inclusive of all gender identities and expressions, students will be referred to by their first or last names, the pronoun of their choice, or by default, the pronoun "they".

Confidentiality of Student Records
See http://www.registrar.arizona.edu/ferpa/default.htm

Life challenges
If you are experiencing unexpected barriers to your success in the courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges
If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

The information in this course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor. Any changes to the syllabus will be announced in class and posted on the D2L website

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Additional Crisis Information

Located in Tucson? Call the Community-Wide Crisis Line 24 hours a day, 7 days a week at 520-622-6000.

Are you a University of Arizona student? If it is not an emergency and you are a UA student, call or walk-in to Counseling and Psych Services at 520-621-3334 Monday - Friday. Walk-in triage is available between 9 am and 4 pm Monday - Friday.

Are you a concerned friend? Concerned friends can find out more about helping a friend who might be experiencing problems through our Friend 2 Friend website.
Resources for sexual assault, relationship violence, and stalking.

24-Hour Hotlines
The National Suicide Prevention Lifeline is a 24-hour, toll-free, confidential suicide prevention hotline available to anyone in suicidal crisis or emotional distress. By dialing 1-800-273-TALK (8255), the call is routed to the nearest crisis center in our national network of more than 150 crisis centers. The Lifeline's national network of local crisis centers provides crisis counseling and mental health referrals day and night.
Crisis Text Line: Text HOME to 741741 from anywhere **in the United States**, anytime, about any type of crisis. A live, trained Crisis Counselor receives the text and responds, all from a secure online platform. Find out more about how it works at crisistextline.org.
Suicide Prevention for LGBTQ Youth through the Trevor Project:

- **The Trevor Lifeline** is a 24/7 suicide hotline: 866-4-U-TREVOR (1-866-488-7386)
- TrevorChat**:** Online instant messaging available 7 days a week, 3 pm - 10 pm ET (12 pm -- 7 pm PT)
- **TrevorText:** Confidential and secure resource that provides live help for LGBTQ youth with a trained specialist, over text messages. Text TREVOR to 1-202-304-1200 (available 7 days a week, 3 pm - 10 pm ET, 12 pm -- 7 pm PT)

Veterans' Suicide Prevention Lifeline: 1-800-273-TALK (1-800-273-8255)
SAMHSA Treatment Referral Hotline (Substance Abuse): 1-800-662-HELP (1-800-662-4357)
National Sexual Assault Hotline: 1-800-656-HOPE (1-800-656-4673)

Loveisrespect (National Dating Abuse Helpline): Call 1-866-331-9474 (TTY: 1-866-331-8453). Text LOVEIS to 22522 - you'll receive a response from a peer advocate prompting you for your question. o ahead and text your comment or question and we will reply.

NROS 308: Methods in Neuroscience
Spring 2024, W 10:00-10:50am
Marina Cholanian, Ph.D.
Biological Sciences West, room 301

Course description
1 credit hours, Spring semester

This course takes advantage of a neuronal modeling program (Neurons in Action) to illustrate the basic physiological properties of neurons. All the in-class activities using the modeling software will correspond to the lectures in NROS 307, thus, concurrent enrollment in NROS307 is required. We will also discuss common experimental methods of confirming those properties.

Lectures: W, 10:00-10:50am, Biological Sciences West, room 301

Course prerequisites
NSCS200 and NROS307 concurrent enrollment (this requirement can be waived at the discretion of the instructor).

Instructor
Marina Cholanian, Ph.D.
Assistant Professor of Practice,
Department of Neuroscience
Office: Gould-Simpson Building - Room 642
Email: shetka@arizona.edu (will reply within 24 hours M-F)
Office hours: Wednesdays at 12:15pm

TA:
Allie Ashman: aashman@arizona.edu

Preceptors:
Kailee Cullinan: kcullinan@arizona.edu

Course website
See D2L website at: https://d2l.arizona.edu
The website will include announcements, assignments, grades, links to required and background reading materials, and slides for all class sessions. Students should check the website regularly.

Learning Objectives:
At the completion of this course you are expected to understand:

- The fundamental mechanisms of neuronal excitability
- The uses and limitations of neuronal modeling
- The basics of other methods in Neuroscience.

Grading policy

Regular grades are awarded for this course:

90-100% A

80-89% B

70-79% C

60-69% D

0-59% E

Grades of Incomplete ("I") will be awarded only at the end of the semester and **not on account of disappointing performance**. Students who are doing poorly in the course should drop it or withdraw (taking a grade of "W") before the UA deadlines for those actions. Requesting "W" grade after the deadline will require a petition to the Dean for an approval.

Problem sets: every class will be focused on answering a set of problems that will be turned in at the end of the class. These will be graded and each will be worth 10 points. There are 10 problem sets for a total of 100 points. There will be 3 meetings at the end of the semester to make-up any missed problem sets (4/12, 4/19, 4/26)

Required materials
***Neurons in Action*, Version 2** by John W. Moore and Ann E. Stuart, Sinauer Associates, 2007. This is available if students want to work the simulations outside of class but is not necessary to work the problem set in class as the software is already loaded onto the VCAT system.

Attendance policy
Attendance records will not be collected, but regular attendance in class – and *active participation in discussions* – is considered essential for success in the course.

All holidays or special events observed by organized religions will be honored for students who show affiliation with those religions. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Further UA policies

The UA's policy concerning mask wearing guidance can be found here:
https://covid19.arizona.edu/

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Equipment and software requirements
For this class you will need daily access to the following hardware: computer or web-enabled device with webcam and microphone; regular access to reliable internet signal; ability to download and run the following software: Adobe Acrobat, Word.

Class Recordings: THIS CLASS WILL NOT BE RECORDED!

Academic advising. If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

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The National Suicide Prevention Lifeline is a 24-hour, toll-free, confidential suicide prevention hotline available to anyone in suicidal crisis or emotional distress. By dialing 1-800-273-TALK (8255), the call is routed to the nearest crisis center in our national network of more than 150 crisis centers. The Lifeline's national network of local crisis centers provides crisis counseling and mental health referrals day and night.
Crisis Text Line: Text HOME to 741741 from anywhere **in the United States**, anytime, about any type of crisis. A live, trained Crisis Counselor receives the text and responds, all from a secure online platform. Find out more about how it works at crisistextline.org.
Suicide Prevention for LGBTQ Youth through the Trevor Project:

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- TrevorChat**:** Online instant messaging available 7 days a week, 3 pm - 10 pm ET (12 pm -- 7 pm PT)
- **TrevorText:** Confidential and secure resource that provides live help for LGBTQ youth with a trained specialist, over text messages. Text TREVOR to 1-202-304-1200 (available 7 days a week, 3 pm - 10 pm ET, 12 pm -- 7 pm PT)

Veterans' Suicide Prevention Lifeline: 1-800-273-TALK (1-800-273-8255)
SAMHSA Treatment Referral Hotline (Substance Abuse): 1-800-662-HELP (1-800-662-4357)
National Sexual Assault Hotline: 1-800-656-HOPE (1-800-656-4673)
Loveisrespect (National Dating Abuse Helpline): Call 1-866-331-9474 (TTY: 1-866-331-8453). Text LOVEIS to 22522 - you'll receive a response from a peer advocate prompting you for your question. Go ahead and text your comment or question and we will reply.

NROS 310 Cellular and Molecular Biology of Neurons Online

COURSE INFORMATION

Course Goals:
This course is designed to provide students with an understanding of molecular and cellular functions and structures. Emphasis will be on how macromolecules assemble and cooperate to carry out common cellular processes including classical genetics, molecular genetics, movement, signal transduction, organelle assembly, and cell division. The course will include a focus on the use and interpretation of experimental data using neurons as model cells.

Course Dates: 3/11/2024-5/13/2024

NSCS Learning Objectives. This course contributes to the following learning objectives for the NSCS major (see NSCS website for more details): NS.12, NS.13, NS.17, NS.18

Prerequisites:
Introductory biology (e.g. MCB/BIOC/EEB/MICR 181 & 182), general college chemistry, elementary quantitative reasoning and problem solving at an advanced college level. College-level courses in organic chemistry and cell biology or biochemistry are strongly recommended. NROS 307 is also strongly recommended.

Course Format:

Online, asynchronous. Every week lectures will be made available on Monday and homework will be due by Sunday 11:59. There will be an exam every other week on the content covered the previous two weeks. Exams will be open for two days (Thursday – Friday).

Instructor:
Jessica Bowersock, Ph.D
jbowersock@arizona.edu **(will reply within 48 hours M-F)**
when emailing, you MUST MUST MUST include NROS 310 in the subject line.

Required Textbook:
Molecular Biology of the Cell (6th edition)
Alberts et al. (2015) Garland Science (publisher)
ISBN: 978-0-8153-4432-2

Lectures and readings:
Lectures and reading assignments are important and required for this course. Lectures will emphasize and seek to clarify important concepts, but readings will include essential material not covered in class. You are responsible for the content of lectures and reading assignments.

Required reading assignments are drawn primarily from the required textbook.

Reading assignments are listed on the content link on D2L. Assigned materials should be read before the class with which they are associated. You are responsible for knowing and understanding the content of the readings. Attendance at lectures and timely completion of reading assignments are essential and expected of all students.

Exams: There will be four in-class examinations with no final exam. Each exam will be worth 150 points.

Study Questions: Each module is accompanied by study questions that serve to emphasize the concepts important for each module. These will be the basis of the exams for each module and will be turned in to be graded.

Playposits: Each recorded lecture is accompanied by one or more playposits. Active participation in these exercises will earn credit based on participation. Each exercise will be worth 2 points. The first 100 will count towards the final grade. Any additional exercises will count as extra credit. These should help guide your progress through the material.

The final grade for NROS 310 will be determined out of 1000 points as follows:

1. The study questions will count 200 points (25 points per module).
2. Playposits will count 200 points.
3. The four hourly exams will be worth 600 points.

Grading: To encourage you to help rather than to compete with each other, the course will be graded on a absolute scale so that if you get the following percentages of graded points, you will get the corresponding grade:

90-100% A
80-89% B
65-79% C
50-64% D
0 - 49% E

To take into account variation in the difficulty of exams from year to year, the 100% score of the exam will be set as the average of the four highest scores in the class. Grades will then be calculated according to this scale. For example, if the average of the 4 highest scores is 195 out of 200, everyone will be given an extra 5 points.

Grades of Incomplete ("I") will be awarded only at the end of the semester and not on account of disappointing performance. Students who are doing poorly in the course should drop it or withdraw (taking a grade of "W") before the UA deadlines for those actions.

Course and University Policies:
Attendance: Attendance at classes will not be recorded, but regular attendance at lectures is considered to be essential for satisfactory understanding of the course material. All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students will be honored. A student who does not appear for a quiz or exam without an official excuse will receive a 0 for that quiz or exam. If a student misses the mid-term or final exam, a make-up exam will be allowed only in cases of well-documented emergencies, with approval of instructor. Make-up exams may be modified from the original and will be given as close to the exam date as possible.

Academic conduct: University of Arizona *Code of Academic Integrity* will be enforced. See: http://deanofstudents.arizona.edu/codeofacademicintegrity

The use of electronic devices (such as but not limited to cell phones, pagers, iPods, etc.) will not be allowed in class. Notebook computers and iPads may be used, but only for note-taking, *if permission of the instructor is granted* and only if they are used in a manner which is not distracting to other students.

The use of audio recording devices to record lectures will be allowed *if permission of the instructor is granted*.

All students are expected not to provide course materials (including lecture recordings, exams, homework, PowerPoint slides, etc.) to anyone not enrolled in the course, including student or business organizations, fraternity and sorority archives, etc.

Classroom Behavior Policy: To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.). Disabilities**:** Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit http://drc.arizona.edu.

Threatening student behavior**:** The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Confidentiality of Student Records

http://www.registrar.arizona.edu/ferpa/default.htm

Faculty Ownership Rights in Lecture Notes and Course Materials

The instructors hold the copyright in their lectures, lecture slides, quizzes and exams, and other course original materials. This copyright includes student notes or summaries that substantially reflect the instructors' lectures or materials. These materials are made available only for personal use by students, and *students may not distribute or reproduce the materials for commercial purposes without the instructors' express written consent*. (This does not prevent students from sharing notes on an individual basis for personal use.) Violation of the instructors' copyright may result in course sanctions and violate the Code of Academic Integrity.

Code of Academic Integrity

Required language: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/codeofacademicintegrity http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

Recommended language: The University Libraries have some excellent tips for avoiding plagiarism, available at http://www.library.arizona.edu/help/tutorials/plagiarism/index.html.

Recommended language: *Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent*. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We

also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Subject to Change Statement:
Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructors. Any changes to the syllabus will be announced in class and posted on the D2L Website.

3/11 – 3/17	Module 1 – Molecular Genetics	M1 study guide due Sunday
3/18 – 3/24	Module 2 – Membranes & Membrane Transport	Exam 1 (Mar 21-22) M2 study guide due Sunday
3/25 – 3/31	Module 3 – Protein Targeting	M3 study guide due Sunday
4/01 – 4/07	Module 4 – Vesicle Trafficking and Protein Degradation	Exam 2 (Apr 11-12) M4 study guide due Sunday
4/08 – 4/14	Module 5 – Signal Transduction Pathways	M5 study guide due Sunday
4/15 – 4/21	Module 6 – Regulation of the Cell Cycle	Exam 3 (Apr 25-26) M6 study guide due Sunday
4/22 – 4/28	Module 7 – Cytoskeleton	M7 study guide due Sunday
4/29 - 5/5	Module 8 – Cell Adhesion Molecules and Moving Cells	Exam 4 (May 9-10) M8 study guide due Sunday

NROS 311 Spring 2023: Scientific Programming using Matlab (3 units)
Professor Charles M. Higgins
SYLLABUS

Course description: This course will provide an introduction to computer programming in Matlab, a practical high-level computing language freely available on campus and commonly used in Neuroscience and Cognitive Science research. **This course will satisfy the programming requirement of the NSCS degree**; however, unlike any of the general-purpose programming courses currently allowed by NSCS degree requirements, it is tailored to the background and needs of NSCS students. The course will be graded based on in-class challenges and multiple programming assignments.

Instructor: Dr. Charles M. Higgins, Associate Professor, Depts. of Neuroscience / Electrical Engineering.
Email: higgins@neurobio.arizona.edu
Web: thehigginslab.com
Office: Gould-Simpson 430
Office Hours: Immediately after every class meeting.
Extra OH may be held when assignments are due.

TA/Preceptors: To be announced on D2L.

Time and Place: Tuesdays and Thursdays from 5:15PM-6:30PM in BioSciences West room 301, *in person*.

Course objectives and expected learning outcomes:
At the completion of this course, you are expected to be able to:
- Explain the basic operation of a computer and how it differs from human thought processes
- Explain the types of data a computer can (and cannot) represent
- Verbally describe an algorithm for performing a given computation and then code it in Matlab
- Write a program, based on high-level blocks (some from the course and some built in to Matlab) to read data from a file in various formats, process that data, print an analysis of the data, plot it in a number of ways, and write results back to a file.

In terms of NSCS learning outcomes, this course addresses *at least* outcomes A.4, A.11, B.2, B.3, and B.6.

Required Textbook and Other Readings: No text; any readings will be provided on D2L.

Course Website and Online Discussions: All information about the course, including this syllabus, will be posted on the course's D2L website. It is your responsibility to check that website regularly for announcements and other course information.

Prerequisites and Corequisites: None.

Required equipment/software: You'll need a computer capable of running Matlab. Matlab is available free to you at this site. Chromebooks and netbooks can't run Matlab. I'll go over in class how to install Matlab in detail.

A note on sharing: In this class we must walk a fine line between sharing ideas with others and working alone. As you'll see in class, I encourage you to share ideas (but not code) in your assigned student groups to solve in-class challenges. These in-class challenges come close to being the assignment we are building toward. However, please be careful that this sharing does not include your assignment or significant portions of it; **assignments are to be completed individually by each student, and sharing your assignment (including by email or privately outside of class) is a violation of the Code of Academic Integrity.**

Tentative topics to be covered:

- What is a computer?
- What is the "native language" of the computer? What is a "higher-level" language?
- How to think like a computer (learn to be blind and obey mindlessly)
- Introduction to Matlab's user interface, GUI, windows, nomenclature (console, editor, …)
- Top-down program design and functional breakdown
- Functions versus scripts
- Fundamental data types
- Structures and arrays of structures
- The "cell" data type (arrays of strings)
- Making simple plots (plot)
- Basic unary and binary operators (<, >, ==, ~=, &&, ||)
- Program flow operators (if/else, for, while, switch …)
- Selected crucial built-in functions (max, min, abs,…)
- Program bug diagnosis and repair (the editor)

Grading policy:

- Regular grades A through E will be given at the end of this course.
- Grades will be based on 5 programming assignments and in-class challenges to be assigned through the term.
- Late policy: a late assignment loses 20% of its course credit per day, or any part thereof.
- No late assignments will be accepted once the semester has ended.
- Grade breakdown: 5 programming assignments are weighted at 20% each.
    - Grades for all of the in-class challenges that we do in preparing for any given assignment will together account for the first 20% of each assignment grade.
    - The remaining 80% of your grade for each assignment is based on the program that you turn in via D2L in response to each assignment, graded on how well it matches assignment requirements.
- The last assignment will serve as the final summative assessment for the course.
- Grading Scheme:
    - 91-100% A
    - 81- 90% B
    - 71- 80% C
    - 61- 70% D
    - 0- 60% E

Programming assignments and in-class challenges:

Five assignments will make up the semester's work, with the last assignment due during finals week. Assignments will be turned in as Matlab (".m") files in the appropriate D2L assignment folder. Details of each assignment will be given in class. As we prepare for each assignment, we will go through a number of in-class challenges. You will be **required to demonstrate the answer** to each of these in-class challenges in class in order to get full credit for the assignment, which means that **class attendance is crucial.** If you can't figure out the challenge, stay after class and get help. Under normal circumstances, you must demonstrate each in-class challenge before leaving class to get credit. However, for any given semester, each student will be allowed **one opportunity** to miss class and demonstrate a late in-class challenge (to the instructor only, and no later than 1 week after the challenge was assigned) without requiring any excuse.

A note on how Zoom office hours work:

Most of my "office hours" will be conducted in person after class, but periodically near assignment due dates I will hold extra office hours on Zoom. If you want to see me, **please come on time** to office hours, and wait in the Zoom waiting room as I help each student one-on-one in the order that they showed up. In general, I will keep seeing students until there are no students left waiting, and then conclude my office hours, exactly as I would if there were a line of students waiting outside my office in person. Please be aware that if you show up significantly after my office hours start, you are risking that I may have already left.

COVID-related University Policies and Information:

Classroom attendance: If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel. Notify your instructor if you will be missing a course meeting or an assignment deadline. Non-attendance for any reason does not guarantee an automatic extension of due date or rescheduling of examinations/assessments. Please communicate and coordinate any request directly with your instructor. If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing. Voluntary, free, and convenient COVID-19 testing is available for students on Main Campus. If you test positive for COVID-19 and you are participating in on-campus activities, you must report your results to Campus Health. To learn more about the process for reporting a positive test, visit the Case Notification Protocol. COVID-19 vaccine is available for all students at Campus Health. Visit the UArizona COVID-19 page for regular updates.

Academic advising: If you have questions about your academic progress this semester, please reach out to your academic advisor (https://advising.arizona.edu/advisors/major). Contact the Advising Resource Center (https://advising.arizona.edu/) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@.arizona.edu.

Life challenges: If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at (520) 621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges: If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Other University Policies and Information:

- **Attendance**: Since this class is entirely practical, and there is no textbook, I strongly advise you to attend all class meetings. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable; **please inform the instructor of any conflicts at the beginning of the semester**. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. The UA's policy concerning class attendance, participation, and administrative drops is available online. Students who have late assignments due to illness or emergency are required to submit documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation may result in late points being deducted.
- **Requests for incomplete or withdrawal** must, surprisingly, be made in accordance with the afore-linked University policies.
- **Academic conduct**: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the University of Arizona Code of Academic Integrity.
- **Threatening student behavior:** The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to oneself. Threatening or disruptive student behavior will not be tolerated in accordance with University policy.
- **Disabilities**: Our goal in the classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let the instructor know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Resource Center to establish reasonable accommodations. If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.
- **Confidentiality of Student Records**: Student records will be kept confidential as required by University Policy and Federal Law.
- **Expected classroom behavior**: University Policy forbids the use of cellular phones and other computing devices during class, in cases where it distracts from or disrupts the course discussion.
- **Plagiarism**: I encourage you to look carefully at Prohibited Conduct in the University Code of Academic Integrity, especially where it addresses plagiarism. This seemingly blatant behavior can be more subtle than you might believe. Note carefully that the policy forbids *assisting others to plagiarize*. Thus if you provide your program, or the results of your program, to the class on Facebook and it shows up in any material turned in for a grade, you and all of the students who used the information you posted have violated the Code of Academic Integrity.
- **Non-discrimination and anti-harassment**: The University is committed to creating and maintaining an environment free of discrimination. University Policy prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. The University encourages anyone who believes he or she has been the subject of discrimination to report the matter immediately at the link given above.
- If you have really been enjoying the long and ever-growing list of University policies above, you might want to just read the whole list. I'm particularly fond of the Policy on Policies, which is how these policies keep multiplying.

Faculty Ownership Rights of Lecture Notes and Course Materials:
The instructor holds the copyright to all programs, computer code, algorithms, questions, lectures, slides, quizzes, exams, and any other original course materials, whether in written, electronic, verbal, or any other form. *Class sessions may not be audio- or video-recorded without the instructor's specific written consent*. This copyright includes student notes or summaries that substantially reflect the instructors' lectures, discussions, or materials. These materials are made available only for personal use by students, and *students may not distribute or reproduce the materials for commercial purposes without the instructor's specific written consent*. This does not prevent students from sharing notes on an individual basis as protected by the "fair use" doctrine of copyright law. Violation of the instructors' copyright may result in course sanctions and violate the Code of Academic Integrity.

Subject to Change Statement:
Information contained in this syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor. Any changes to this syllabus will be posted on the course D2L website.

NROS 314

CURE: Auditory Neuroscience Research Experience (3 units)

The BAT Lab

PRELIMINARY SYLLABUS

Fall 2025

Course description:

How do animals communicate and navigate using sound? How do they alter their vocalizations in response to the auditory environment? How do their brains enable these abilities? These are among the questions that we will address in this CURE course. We will examine these topics by looking at two different organisms. First, how do bats alter their vocalizations, including social calls and echolocation, in different environments? Second, how do individual birds change their courtship songs throughout the breeding season? And/or, how do different birds change their courtship songs based upon the environment in which they live? To answer these questions, you'll do original research in auditory neuroscience with a team of undergraduates focused on recording and processing ultrasonic bat vocalizations and the songs of birds. Whenever possible, we will go out and collect ultrasound recordings of live bat vocalizations (roughly April-November every year) and recordings of local bird songs (April to October). When this is impossible, we will fall back on recordings from a vast library of locally-recorded bat calls and bird songs. We will explore what bats are "saying" when they are not vocalizing for echolocation, and survey the types of wild bats that are present in the Tucson area. Similarly, we will analyze bird songs from the same species in different environments, or from the same bird individual over time. You will learn to use pre-existing processing blocks in Simulink (a "low code" block-based coding environment) to analyze the bat and bird vocalization data. You will be challenged to create an analysis program to identify which species of bat or bird is vocalizing, and to determine whether a given vocalization is a sonar call, a bird's song, or social call. We will discuss how the bat brain supports echolocation, how the bird brain learns and maintains its songs, and which areas of the brain support different types of vocalizations, in both bats and birds. You will have the opportunity to process recorded neuronal data from both flying and resting bats while they vocalized and surveyed their surroundings via echolocation. In addition to scientific skills, you will gain professional skills including technical writing, communication, and teamwork. You will work weekly in lab and "check in" every week with instructors to get help with any obstacles, but your grade will be based on four checkpoints" in which you will present your progress, spread evenly across the semester.

Time and Place:

<days TBA> from <times TBA>. All class meetings will be held in BioWest room <room TBA>, the CURE teaching lab.

Instructors:

Dr. Melville J. Wohlgemuth, Assistant Professor, Dept. of Neuroscience
Email: wohlgemuth@arizona.edu
Office: Gould Simpson 636
Office Hours: TBA

Dr. Charles M. Higgins, Associate Professor, Depts. of Neuroscience / Electrical Engineering
Email: cmh@arizona.edu
Office: Gould Simpson 430
Office Hours: TBA

Computing Equipment: For this course, you will need both a laptop computer (Mac or Windows) to process data, and a modern smartphone/tablet (iPhone or Android) to collect it.

Prerequisites/Corequisites: None.

Required Textbook and Other Readings: *No text.* Readings will be provided on D2L.

Required extracurricular activities: Periodically the class will travel to Tucson locations to record bird and bat auditory data. Times will be agreed upon during class hours.

Course Objectives:
During this course, students will:

1. Record birds and bats vocalizing in wild conditions.
2. Analyze their recorded auditory data, along with pre-recorded auditory and neuronal data, using a computer.
3. Improve their writing, presentation, and analysis skills by working as a team.

Expected Learning Outcomes:
At the completion of this course, students will be able to:

1. Record bat vocalizations and birdsong in the field and upload this data to a computer.
2. Process bat ultrasound vocalizations in Simulink to make them audible to humans.
3. Create data analysis routines in Simulink to process auditory data (signal processing)
3. Synthesize the results of experiments and present this to peers.
4. Keep a detailed notebook and document progress on a research project.

Grading:
Grades will be based on four in-class presentations, peer evaluations, the laboratory notebook, and writing reflections.

- 75%: Three quarter-semester group presentation "checkpoints" at 25% each:
    - Instructor evaluation of presentation and research progress (10%)
    - Peer evaluations of each individual's specific contributions (5%)
    - Instructor evaluation of individual laboratory notebook (5%)
    - Instructor evaluation of assigned writing reflections (5%)
- 25%: A final summary group presentation covering the whole semester that serves as the final summative assessment for the course:
    - Instructor evaluation of presentation and research progress (10%)
    - Peer evaluations of each individual's specific contributions (5%)
    - Instructor evaluation of individual laboratory notebook (5%)
    - Instructor evaluation of assigned writing reflections (5%)

Letter grades A-E will be awarded on the following thresholds: A is 90-100%, B is 80-89%, C is 70-79%, D is 60-69%, and E is less than 60%. No late work will be accepted without prior discussion with the instructors or a valid excuse. There are no exams, quizzes, or finals in this course.

Scheduled Topics/Activities:
As this is a discovery-based research course, **the conduct of course activities will be fluid, and depend on the results of previous activities, so the focus of the class will change as discoveries are made**. A rough outline of activities is below.

- Tutorials (early in the semester):
    - Bat and bird vocalizations, for echolocation and social calls
    - Auditory neuroanatomy
    - Recording auditory data with a smartphone/tablet and the echo meter touch device
    - Digitization of animal sounds: sampling, the Nyquist rate, and aliasing
    - Simulink: a "low code" environment, with custom auditory processing blocks
    - Slowing down bat auditory data using a Simulink program
    - Maintaining a lab notebook, and exactly what should be in a lab notebook
- Weekly activities:
    - Visits to Tucson locations to record auditory data from bats and birds
    - Update and discussion of laboratory notebooks
    - Formation of teams and assignment of team-based tasks
    - Team progress reports
- Daily activities:
    - Discussions of latest data acquired and methods of processing this data
    - Analysis of bat and bird auditory data for purposes including:
        - Determination of species
        - Discrimination of echolocation from social calls
        - Measurements of acoustic features
    - Creation of research products (tables, graphs, charts) to illustrate progress
    - Formulation of new research directions

Acknowledgement:
The instructors would like to thank Prof. Martha Bhattacharya for her help with this course. Many concepts in this syllabus were based on her ideas.

Course and University Policies:

- **Attendance**: Since your grade is based on laboratory performance, there is no textbook, and we will only demonstrate things once, **it is essential that you attend every class meeting**. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable; **please inform the instructor of any conflicts at the beginning of the semester**. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. The UA's policy concerning class attendance, participation, and administrative drops is available online. Students who miss class due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences.
- **Requests for incomplete or withdrawal** must, surprisingly, be made in accordance with University policies.
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product of independent effort unless otherwise instructed. Students are expected to adhere to the University of Arizona Code of Academic Integrity.

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- **Confidentiality of Student Records**: Student records will be kept confidential as required by University Policy and Federal Law.
- **Expected classroom behavior**: University Policy forbids the use of cellular phones and other computing devices during class in cases where it distracts from or disrupts the course. This rule generally still holds true here. However, you are encouraged to use your cellular phone, computer, and any other computing devices that may be nearby, worn on, or embedded in your person to help the class get the answers to discussion questions. This particular use of cell phones is not disruptive.
- **Plagiarism**: I encourage you to look carefully at Prohibited Conduct in the University Code of Academic Integrity, especially where it addresses plagiarism. This seemingly blatant behavior can be more subtle than you might believe. ***Nota bene,*** the policy forbids assisting others to plagiarize. Thus if you provide the results of your experiment to the class on Facebook and it shows up in multiple written reports, you and all of the students who used your data have violated the Code of Academic Integrity.
- **Non-discrimination and anti-harassment**: The University is committed to creating and maintaining an environment free of discrimination. University Policy prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. The University encourages anyone who believes he or she has been the subject of discrimination to report the matter immediately at the link given above.
- **Safety on campus and in the classroom**: For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT). Also watch the video available here.
- If you have really been enjoying the long and ever-growing list of University Policies above, you might want to read the whole list. I'm particularly fond of the Policy on Policies, which is how these keep multiplying.

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individual basis as protected by the “fair use” doctrine of copyright law. Violation of the instructors' copyright may result in course sanctions and violate the Code of Academic Integrity.

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COURSE SYLLABUS

Cellular Neurophysiology NROS 315B

Description of Course. This course takes advantage of a neuronal modeling program to illustrate the basic physiological properties of neurons. We will also discuss common experimental methods of confirming those properties.

Time of Classes
Two Sections
Section 1: Monday 4-4:50 Room 125 ILC
Section 2: Friday 4-4:50 Room 125 ILC

Instructor:
Dr. Alan Nighorn, University Distinguished Professor and Head, Department of Neuroscience
nighorn@email.arizona.edu
Office: Gould Simpson 603
Office Hours: Wednesday 1-2 (or just about anytime by appointment)

Course Website
All information about the course will be posted at the course's D2L Website. It is the student's responsibility to check that Website regularly to check for announcements and other important course information.

Course Objectives:
At the completion of this course you are expected to understand:
- The fundamental mechanisms of neuronal excitability
- The uses and limitations of neuronal modeling
- The basics of other methods in Neuroscience.

Expected Learning Outcomes: This course contributes to the following learning objectives for the NSCS major (see NSCS website for more details): A1, A2, A11, B1-B5, and C1

Prerequisites
NSCS 200

Corequisites
NROS 307

Teaching Format
Flipped Classroom Lectures.

Suggested Textbook and Other Readings
***Neurons in Action*, Version 2** by John W. Moore and Ann E. Stuart, Sinauer Associates, 2007. This is suggested if students want to work the simulations outside of class but is not necessary to work the problem set in class as the software is already loaded onto the ILC computers.

Grading

Regular grades are awarded for this course: ABCDE with your grade being based on answers to problem sets that are filled out during class.

Problem Sets: Every class will be focused on answering a set of problems that will be turned in no later than 24 hours after the finish of class. These will be graded and each will be worth 10 points. There are 10 problems sets for a total of 100 points.

Grading Scheme: To encourage students to help rather than to compete with each other, the course will be graded on an absolute scale in which we guarantee that if a student gets the following percentages of graded points, they will get the corresponding grade:

90-100% A
80- 89% B
65- 79% C
50- 64% D
0- 49% E

Course and University Policies:

Attendance: Attendance at classes is essential and will be recorded. All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students will be honored.

Academic conduct: University of Arizona *Code of Academic Integrity* will be enforced. See: http://deanofstudents.arizona.edu/codeofacademicintegrity

The use of electronic devices (such as but not limited to cell phones, pagers, iPods, etc.) will not be allowed in class. Notebook computers and iPads may be used, but only for note-taking, *if permission of the instructor is granted* and only if they are used in a manner which is not distracting to other students.

All students are expected not to provide course materials (including lecture recordings, exams, homework, PowerPoint slides, etc.) to anyone not enrolled in the course, including student or business organizations, fraternity and sorority archives, etc.

Classroom Behavior Policy: To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Disabilities**:** Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit http://drc.arizona.edu.

Threatening student behavior**:** The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Confidentiality of Student Records

http://www.registrar.arizona.edu/ferpa/default.htm

Faculty Ownership Rights in Lecture Notes and Course Materials

The instructors hold the copyright in their lectures, lecture slides, quizzes and exams, and other course original materials. This copyright includes student notes or summaries that substantially reflect the instructors' lectures or materials. These materials are made available only for personal use by students, and *students may not distribute or reproduce the materials for commercial purposes without the instructors' express written consent*. (This does not prevent students from sharing notes on an individual basis for personal use.) Violation of the instructors' copyright may result in course sanctions and violate the Code of Academic Integrity.

Code of Academic Integrity

Required language: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:
http://deanofstudents.arizona.edu/codeofacademicintegrity
http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

Recommended language: The University Libraries have some excellent tips for avoiding plagiarism, available at http://www.library.arizona.edu/help/tutorials/plagiarism/index.html.

Recommended language: *Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent.* Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy
Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Subject to Change Statement:
Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructors. Any changes to the syllabus will be announced in class and posted on the D2L Website.

NROS 318: Systems Neuroscience

Location: TBD

Times: MWF 10-10:50 am

Description of Course

This course will provide a fundamental understanding of how neural systems encode sensory information, form perceptions of the external and internal world, make decisions, generate movements, and control behaviors and physiological processes through the description and analysis of the neural system. Our materials will incorporate primary literature to explore the nature of these functionalities within the context of specific neural systems, as well as the brain properties that overlay and coordinate system functions.

Credit. 3 units. According to university policy, students should, on average, expect up to 2 hours of work outside of class for each hour spent in class.

Course Prerequisites or Co-requisites

This course assumes a strong foundation in the fundamentals of cellular neurophysiology and completion of chemistry and physics prerequisites. It is your responsibility to review this material as necessary. Classes will encompass lectures, small-group discussions, and projects/problem-solving exercises.

Pre-requisite courses: NROS 2XX, Chemistry, Physics

Recommended:

Instructor and Contact Information

Haijiang Cai, Ph.D., Associate Professor, Department of Neuroscience
haijiangcai@arizona.edu
Telephone: 520-621-6654
Instructor home page: https://neurosci.arizona.edu/person/haijiang-cai-phd
Office: Gould-Simpson 427
Office hours: by appointment

TBD, Teaching assistant
@arizona.edu
Office hours: by appointment

Course website: see D2L website (https://d2l.arizona.edu)
The D2L website will include announcements, assignments, grades, links to required and background reading materials, and slides for all class sessions. Students should check the website regularly.

Course Format and Teaching Methods

Lectures, small-group activities or group projects, in-class discussion, web-delivered content or assessment, etc.

Course Objectives

This course aims to provide high-level undergraduate students with a comprehensive understanding of the fundamental principles governing the complex functions within neural systems. Students will delve into the intricacies of how neural circuits function to encode and process information, exploring the integration of sensory input, decision-making processes, and the generation of movements. The objective is to equip students with a solid grasp of systems-level neuroscientific concepts, preparing them to

analyze and comprehend the dynamic nature of neural networks. Through a combination of lectures, discussions, and hands-on projects, students will gain insights into the principles shaping our understanding of the brain's sophisticated organization and its implications for behaviors.

Expected Learning Outcomes

By the end of the course, you should be able to:

1. Explain how neurons detect and process sensory information, including receptor function, transduction processes, and conduction properties. Compare and contrast these processes across various sensory modalities.
2. Describe the fundamental anatomical organization (including diagrams) and functional properties of the visual, auditory/vestibular, olfactory/taste, and somatosensory systems.
3. Explain how motor behaviors are generated, covering the basic anatomy of reflex and descending motor pathways, central pattern generators, and the regulation of motor activity by higher-order circuits in the brain.
4. Explain how brain rhythms and diffuse modulatory circuits affect the functioning of the nervous system.
5. Describe the fundamental anatomical organization (including diagrams) and network function of circuits responsible for common behaviors such as eating, emotion, and social interactions.
6. Predict the consequences of lesions within neural pathways, understand the mechanisms, and identify affected nervous systems in common neurological diseases such as Parkinson's disease, anxiety disorders, and depression.

Makeup Policy for Students Who Register Late

Students who register after the first class meeting may make up missed assignments/quizzes with an adjusted deadline approved by the instructor.

Course Communications

The students should communicate with the instructor through UA e-mail or D2L.

Required Texts or Readings

No required textbooks, but we recommend these textbooks for reference.

1. Kandel, ER. *et al*. (2021) *Principles of Neural Science* 6th edition. New York: McGraw Hill Medical. ISBN 9781259642234.
2. Bear, MF. *et al*. (2016) *Neuroscience: Exploring the Brain, 4th Edition*. Philadelphia: Wolters Kluwer. 978-2-36110-080-3.
3. Luo, L (2020) Principles of Neurobiology. New York: Garland Science. ISBN 9780367514716 (hbk), 9780815346050 (pbk) 9781003053972 (ebk).

Required or Special Materials

None.

Required Extracurricular Activities

Not applicable.

Assignments and Examinations: Schedule/Due Dates

Study guides questions will be posted on D2L (see D2L-Contents: ***Study guides***). It will require readings from class lectures (PPT file with brief text will be posted on D2L), textbooks by Kandel, Luo or Bear or Luo, and occasionally from other sources. You may use textbooks, online resources (vetted sources), or material found on PubMed. There usually will be two sets of study guides questions. **(1) Anatomy preparation**. The purpose is to teach yourself the basic neuroanatomy of the neural system that will be covered in the following lectures. **(2) Review questions**. The purpose is to help you go over the key points

covered in the previous lectures and some contents not covered in the lectures but important to know. There will be **10 study guides, 20 points each**.

Must be turned in at D2L on the date indicated on the class schedule. Assignments on the date indicated on the class schedule. 1 day later 75%, 2 days later 50%, > 2 days 0%. Without permission given before the posted deadline, assignments will not be accepted later than 2 days.

Quizzes. Each quiz will emphasize course material covered through the week before the quiz. There will be a short **ONLINE** quiz on most Fridays (12 in total, see class schedule), **5 points each**. The **top 10 quiz grades will count towards the final grade**. **No make-up quizzes will be offered**.

Exams. There are **3 in-class exams** including the final (see class schedule), and part of the final is cumulative, **100 points each**. There will be a review session for each exam and exams will be composed largely of short-answer (may include diagrams) questions that require a few sentences or a short paragraph.

***Extra credit*.** You may earn up to **20 points**. At the end of the course, these points will be added manually to the points earned in required activities. The extra credit project is a detailed summary and critique of a primary, peer-reviewed research paper (**note: not a review paper that summarizes recent progress**) on one of several topics relevant to the course, or a related neuroscience research seminar (https://neurosci.arizona.edu/calendar or https://neuroscience.arizona.edu/events/seminars, you must consult the instructor before you decide which seminar you want to report. For each topic, you will also be expected to seek out other papers, vetted online resources, or textbook materials as needed to understand the goals, methods and results described in the primary paper.

Typically, an original research paper will have (1) background introduction, why the authors study this question, why the question is important; (2) the specific question or hypothesis that the author raised or planned to test; (3) design and perform a series of experiment to answer the question or test their hypothesis; (4) present their results and make their conclusions; (5) interpret their results, discuss the progress and new knowledge through their research, and limitation of their research. As long as your report covers these points and makes your own comments on the strengths and weaknesses of the paper, you should get full points.

Expect to write 4-5 pages, 1.5 line spacing, 1-inch margins, 11 or 12 font size.

Please see the class schedule for the due date of these assignments and exams.

Final Examination or Project

TBD or please see the class schedule.

Grading Scale and Policies

You are expected to attend and actively participate in every phase of the course. Final grades will be based on total points and decisions about students on the cusp of a higher grade (within 0.5 points) will take into account the level of participation observed during the course. Your grade for each assignment will be posted in D2L.

Total possible points:
A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%

Assignment	*Points*	*~% of Final Grade*
Study guides: (10@20 points each)	200	36%
Quizzes: (10@5 points each)	50	9%
Exams (3 including the final@100 points each)	300	55%
Total	**550**	**100%**

Extra credits	Up to 20 points	~4%

Late assignments

Assignments turned in 1 day later 75%, 2 days later 50%, > 2 days 0%. Without permission given before the posted deadline, assignments will not be accepted later than 2 days.

Re-grading policy

If you believe that there has been an error in grading of an assignment, quiz or exam, please contact the TA who will review the material in question. The instructors will be a second level of access if the TA is not able to resolve the concern. *You must initiate a request for re-grading within 1 week of the date on which the grade was posted*, otherwise we will not consider the request.

If the course is a 400/500:

Not applicable.

Incomplete (I) or Withdrawal (W):

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policy, which is available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system.

Dispute of Grade Policy

If you believe that there has been an error in grading of an assignment, quiz or exam, please contact the TA who will review the material in question. The instructors will be a second level of access if the TA is not able to resolve the concern. *You must initiate a request for re-grading within 1 week of the date on which the grade was posted*, otherwise we will not consider the request.

Honors Credit

Students wishing to contract this course for Honors Credit should email me to set up an appointment to discuss the terms of the contract. Information on Honors Contracts can be found at https://www.honors.arizona.edu/honors-contracts.

The student is expected to present a detailed summary and critique of a primary, peer-reviewed research paper(s) on one of several topics relevant to the course, you must consult the instructor before you decide which paper(s) you want to report). There might be one or two associated review papers that will provide background for topic. You will be expected to seek out other papers, vetted online resources, or textbook materials as needed to understand the goals, methods and results described in the primary paper.

Typically, a research paper will have (1) background introduction, why the authors study this question, why the question is important; (2) the specific question or hypothesis that the author raised or planned to test; (3) design and perform a series of experiment to answer the question or test their hypothesis; (4) present their results and make their conclusions; (5) interpret their results, discuss the progress and new knowledge through their research, and limitation of their research.

Scheduled Topics/Activities

The date will change based on academic calendar every semester.

Date	**Quiz** date	**Study guides** due date	**Contents**
Jan 10 WED			Course introduction
Jan 12 FRI			Fundamentals of neural circuits
Jan 15 MON			Martin Luther King Jr Holiday - no classes
Jan 17 WED		1	*Module 1: Sensory system -- How does the brain detect and represent the information about the external world and internal body.* Visual system 1 – retina

Jan 19 FRI	1		Visual system 2 – receptive field
Jan 22 MON			Visual system 3 – visual pathway
Jan 24 WED			Visual system 4 – cortex and perception
Jan 26 FRI	2		Visual system 5 – development and plasticity
Jan 29 MON		2	Auditory system 1 – hearing structures
Jan 31 WED			Auditory system 2 – neural pathway
Feb 2 FRI	3		*Guest lecture 1*
Feb 5 MON			Auditory system 3 – sound location
Feb 7 WED			Vestibular system and Posture
Feb 9 FRI	4	3	Olfactory system
Feb 12 MON			Taste
Feb 14 WED		4	Review session before Exam 1
Feb 16 FRI			**Exam 1**
Feb 19 MON			Somatosensory system 1 – peripheral
Feb 21 WED			Somatosensory system 2 – pathway
Feb 23 FRI	5		*Guest lecture 2*
Feb 26 MON			Somatosensory system 3 – cortex
Feb 28 WED			Pain and Itch
Mar 1 FRI	6	5	Interoception
Mar 2-10			Spring break, no class
Mar 11 MON			*Module 2: Motor system -- How does the brain control movement.* Peripheral motor system
Mar 13 WED			Spinal motor system 1 – rhythmic movement
Mar 15 FRI	7		Spinal motor system 2 – CPG mechanism
Mar 18 MON		6	Brain motor system 1 – descending control
Mar 20 WED			Brain motor system 2 – cortex and cerebellum
Mar 22 FRI	8		Brain motor system 3 – basal ganglia
Mar 25 MON		7	Visceral motor system and Autonomic nervous system
Mar 27 WED			**Exam 2**
Mar 29 FRI	9		*Module 3: Behavioral system – How does the brain integrate information to response.* Neuromodulation
Apr 1 MON			Circadian rhythm and sleep 1
Apr 3 WED			Circadian rhythm and sleep 2
Apr 5 FRI	10	8	Emotion 1 – fear
Apr 8 MON			Emotion 2 – anxiety
Apr 10 WED			Stress response 1 – HPA/HPG axis
Apr 12 FRI	11		Stress response 2 – chronic stress
Apr 15 MON			Gut-brain axis & Microbiota
Apr 17 WED		9	Motivated behaviors 1
Apr 19 FRI	12		Motivated behaviors 2
Apr 22 MON			Social and sexual behaviors
Apr 24 WED			Approaches to study systems neuroscience
Apr 26 FRI		10	Honors presentation
Apr 29 MON			Honors presentation. Due date of the Extra Credit.
May 1 WED			No class, exam preparation.
May 3 FRI			**Exam 3 (Final 10:30-12:00)**

Bibliography

All bibliography materials will be posted on D2L.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Additional recommendations depending on instructor preferences:

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Alternate language for those who want to restrict computers and laptops to an area of the classroom:

Some learning styles are best served by using personal electronics, such as laptops and iPads. These devices can be distracting to other learners. Therefore, students who prefer to use electronic devices for note-taking during lecture should use one side of the classroom.

Alternate recommended language for those who do not wish to permit laptops in the classroom:

The use of personal electronics such as laptops, iPads, and other such mobile devices is distracting to the other students and the instructor. Their use can degrade the learning environment. Therefore, students are not permitted to use these devices during the class period.

Notification of Objectionable Materials

This course will contain material of a mature nature, which may include explicit language, depictions of nudity, sexual situations, and/or violence. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Safety on Campus and in the Classroom

For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview

Also watch the video available at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy000000000003560

Additional Resources for Students

UA Academic policies and procedures are available at http://catalog.arizona.edu/policies

Campus Health
http://www.health.arizona.edu/
Campus Health provides quality medical and mental health care services through virtual and in-person care.
Phone: 520-621-9202

Counseling and Psych Services (CAPS)
https://health.arizona.edu/counseling-psych-services
CAPS provides mental health care, including short-term counseling services.

Phone: 520-621-3334

The Dean of Students Office's Student Assistance Program
https://deanofstudents.arizona.edu/support/student-assistance
Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services.
Email: DOS-deanofstudents@arizona.edu
Phone: 520-621-7057

Survivor Advocacy Program
https://survivoradvocacy.arizona.edu/
The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.
Email: survivoradvocacy@arizona.edu
Phone: 520-621-5767

Confidentiality of Student Records

http://www.registrar.arizona.edu/ferpa

University-wide Policies link

Links to the following UA policies are provided here, http://catalog.arizona.edu/syllabus-policies:

- Absence and Class Participation Policies
- Threatening Behavior Policy
- Accessibility and Accommodations Policy
- Code of Academic Integrity
- Nondiscrimination and Anti-Harassment Policy
- Subject to Change Statement

Fall 2023: NROS 330 Principles of Neuroanatomy (iCourse/AZ Online)

COURSE INFORMATION

Course Description: This online course is designed to provide students with an understanding of anatomy and function of all human brain and spinal cord structures. Emphasis will be on gross and microanatomy of the brain, cranial nerves, spinal cord, and spinal nerves in normal and pathological states in the human. Additionally, the course will cover some selected animal models that are used to study human brain diseases.

Dates: 10/12/2023-12/06/2023

Prerequisites: Introductory biology (e.g. MCB/BIOC/EEB/MICR 181 & 182), general college chemistry, elementary quantitative reasoning and problem solving at an advanced college level. NSCS200 or NROS 307 are strongly recommended. College-level courses in organic chemistry and cell biology or biochemistry are recommended.

Instructor: Julie E. Miller, Ph.D
Dept. of Neuroscience
Gould-Simpson Bldg Rm 423
E-mail: juliemiller@arizona.edu
Office Hours: via zoom, to be announced

Preceptors:
Natalie Pavlick: npavlick@arizona.edu
Madelyn Barsness: madelynmbarsness@arizona.edu
Office Hours: via zoom, to be announced

Course Format/Site: Online only and asynchronous (no live lectures); pre-recorded lectures were developed by Marina Cholanian, Ph.D. Site: d2l.arizona.edu

Course objectives: Fundamental knowledge about the anatomy of the brain, spinal cord, and peripheral nervous system and how the circuits integrate will be conveyed in lecture format and through participation in discussion activities.

NSCS Learning Outcomes: This course contributes to the following learning objectives for the NSCS major (see NSCS website for more details): A1, A10, A11, NS14, NS15, NS16.

Course Communications: This will be conveyed through e-mail and the D2L announcements page. Students are responsible for reviewing these communications in a timely manner.

Recommended Textbooks: (freely available as a hard cover or e-book through the UA libraries-see below; also you can purchase them through the UA bookstore)

1) Nolte's The Human Brain: An Introduction to its Functional Anatomy (8th Edition); Vanderah & Douglas (Elsevier) [Dr. Nolte was a professor in the College of Medicine here at the UA and originally developed this textbook; Prof Miller took his medical course in Neuroanatomy
ISBN: 978-0323653985
March 2020
Freely available as hardcover or e-book from UA libraries (must be logged into VPN if off-campus): https://www-clinicalkey-com.ezproxy4.library.arizona.edu/#!/browse/book/3-s2.0-C2018000609X

2) *Nolte's The Human Brain in Photographs and Diagrams* (5th edition); Vanderah & Douglas (Elsevier)
ISBN: 978-0323598163
Jan 2019
Freely available as hardcover or e-book from UA libraries (must be logged into VPN if off-campus): https://www-clinicalkey-com.ezproxy4.library.arizona.edu/#!/browse/book/3-s2.0-C20170008030

Lectures: Recorded and self-paced. Lectures contain a playposit exercise along with videos of anatomical dissections and subject case examples. Active participation in these exercises will earn credit based on participation and not accuracy of answers. Each exercise will be worth 5 points. 35 out of 39 in-class exercises will count towards the final grade.

Study Questions: Each lecture is accompanied by some study questions to guide you in integrating that lecture's material. Students are responsible for knowing the contents of the whole lecture including embedded videos, images, etc.

Assignments and Examinations:

Quizzes: There will be a quiz testing your knowledge for that week's module worth 100 points. Each quiz is open from Friday to Monday at 5pm. You have 45 min to take the quiz. The quiz consists of 12 questions (multiple choice, True/False, fill in the blank) split pretty evenly across the lectures for that module. There are seven total quizzes, and they are automatically graded. They are open book/notes, but you cannot consult a classmate nor an AI platform. **There is NO final exam.**

Participation Assignments: The Assignments tab in D2L contains three assignments for modules 2 (25 pts), 4 (25 pts), 6 (20 pts) worth a total of 70 pts. Write a short paragraph containing an effortful answer to that question directly in the text box for participation points (it is not graded for accuracy).

Grading Scale and Policies:
The final grade for NROS 330 will be determined out of 945 points as follows:

1. Quizzes will count for 700 points (100 points per module x 7 modules).
2. Playposit exercises embedded in the recorded lecture will count for 175 points (5 participation points per exercise-not graded for accuracy); 35 out of 39 in-class exercises will count towards the final grade.
3. Participation Assignments: will count 70 points (25, 25, 20 pts) points per discussion, graded for effort and not accuracy)

Final Course Grade Assignments:

A	90-100%
B	80-89%
C	70-79%
D	60-69%
E	below 60%

http://catalog.arizona.edu/policy/grades-and-grading-system
***Please note that grades cannot be negotiated as that would not be fair to the entire class. Any final numerical grades at 0.5 decimal points or less from a new letter grade will be rounded up. For example, an 89.5 will become a 90 (resulting in an A).**

Requests for incompletes (I) and withdrawal (W):

These requests must be made in accordance with University policies which are available at
http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and
http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

Students are responsible for being aware of deadlines and conditions for a Withdrawal from the course. They are strongly urged to discuss their concerns early on with the instructor.

Honors credit: None

Schedule of Topics: see D2L course site for more details
Module 1: The Central Nervous System
Module 2: The Cranial Nerves
Module 3: Pain & Touch and the Somatosensory System
Module 4: Motor Control
Module 5: Hypothalamic Nuclei
Module 6: Analyzing the Nervous System, and the Limbic System
Module 7: The Special Senses and Models of Brain Disease

Absences:
Please notify your instructor if you have an emergency situation that prevents you from submitting work on time and would like to request an extension of the due date. If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office: DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable,
https://policy.arizona.edu/human-resources/religious-accommodation-policy

Accessibility and Accommodations:
At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (DRC, 520-621-3268, https://drc.arizona.edu/) to establish reasonable accommodations. The **DRC is designated by the institution to ensure access for disabled students and employees.** As such, all disability documentation and requests for accommodations must be handled by DRC. Students can affiliate with DRC through an online process. Our Access Consultants work with students and collaborate with instructors and colleges regarding reasonable accommodations and DRC's processes.

Student Assistance:
https://deanofstudents.arizona.edu/support/student-assistance

Academic Advising:
If you have questions about your academic progress this semester, please reach out to your academic advisor (https://advising.arizona.edu/advisors/major). Contact the Advising Resource Center (https://advising.arizona.edu/) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@arizona.edu

Code of Academic Integrity:
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials with each other. **However, graded work/exercises must be the product of**

independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog.
See: https://deanofstudents.arizona.edu/policies/code-academic-integrity
The University Libraries have some excellent tips for avoiding plagiarism:
https://new.library.arizona.edu/research/citing/plagiarism

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA email to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student email addresses. This conduct may also constitute copyright infringement.

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The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See
https://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students

Nondiscrimination and Anti-Harassment Policy: The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy **(link is external).**

Safety on Campus and in the Classroom
For a list of emergency procedures for all types on incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview (link is external).

Also watch the video available
at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy00000000003560

Statement of Copyrighted Materials:
Students are advised that all course materials disseminated by the instructor to the students, whether in-class or online (i.e. D2L), are original materials and as such, reflect intellectual property of the instructor or author of those works. Any notes and handouts are intended for individual use by the student. Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

Confidentiality of Student Records:
https://registrar.arizona.edu/privacy-ferpa/ferpa-compliance

University-wide Policies link: http://catalog.arizona.edu/syllabus-policies

Land Acknowledgement:

We respectfully acknowledge the University of Arizona is on the land and territories of Indigenous peoples. Today, Arizona is home to 22 federally recognized tribes, with Tucson being home to the O'odham and the Yaqui. Committed to diversity and inclusion, the University strives to build sustainable relationships with sovereign Native Nations and Indigenous communities through education offerings, partnerships, and community service. For more information about the native lands on which UArizona sits, see nasa.arizona.edu.

Subject to Change Statement:

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor; https://policy.arizona.edu/faculty-affairs-and-academics/course-syllabus-policy-undergraduate-template

"Animal brains, signals, sex, and social behaviors" (NROS 381)
Spring 2024

This is a Writing Emphasis Course

Please note, this document provides plenty of additional useful information besides the actual course description. Please read the entire document.

Course Description: "Animal brains, signals, sex, and social behaviors" is an **in-person** undergraduate level **Writing Emphasis** course.
This three-credit course will entail one 1 1/2-hour illustrated lecture every Tuesday, and a 1 1/2 -hour group discussion of one to three publications relevant to the preceding lecture on Thursdays. Students will be encouraged to raise questions and discuss issues after the end of lecture and discussion sessions *via* email or D2L. The course is intended as a broad introduction to relationship between brain organization, evolution, and animal and human behavior using selected examples.

Course Objectives: This course introduces fundamental aspects of neuronal organization and nervous system functionalities across phyla. It considers the early evolution of brain and central nervous systems, focusing on correspondences of organization and pathways in chordates, arthropods and cephalopods considering sensory perception, processing, integration and motor control. The course discusses the relationship between the functional organization of brains and the signals in the animal world that brains process to elicit behavioral actions. The course provides an appreciation of strategies used to observe, analyze, and study functional brain organization, relating this to the study of animal behavior, in particular emphasizing social and sexual interactions within and between species.

Course Format and Teaching Methods: The course employs lectures and discussion sessions. During the discussion sessions, individual or pairs of two students will introduce their respective topics/papers and stimulate the discussion using a PowerPoint presentation. In addition, students will have to submit **two written exercises** in this **writing intensive course**.

Prerequisite(s): Two courses from Tier One, Natural Sciences (NATS 101, 102, 104). Approved as: General Education Tier Two - Natural Sciences.

Instructors:

Nicholas Strausfeld, Ph.D.
Dept. of Neuroscience
Gould-Simpson Sci. Build. 415
(flybrain@arizona.edu)
http://neurosci.arizona.edu/faculty/strausfeld/lab

Wulfila Gronenberg, Ph.D.
Dept. of Neuroscience
Gould-Simpson Sci. Build. 422
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http://neurosci.arizona.edu/faculty/gronenberg

Teaching Assistant: Meagan Ash (them/they); meaganash@arizona.edu

All office hours by appointment

Expected learning outcomes:

The overarching goal of the course is to provide students with a breadth and depth of understanding about the field of neuroscience and how nervous systems generate and control behavior.

Concepts are explored in great depth through presentations by the instructors and by students, through discussions of scientific papers, and through written essays that require synthesis, integration, critical evaluation, and experimental design. Students will develop the capacity to think critically and flexibly about complex problems involving the brain and behavior, and they will develop the capacity to skillfully communicate concepts and research results to professionals and to the public.

This course will introduce students to current research issues, and course assignments will require critical analysis of research, in both written and oral formats.

Students will apply ethical and professional standards to their evaluation of brain and behavior-related research and technical development in the context of their own work and in the context of issues in the larger societal community. The course will include discussion of ethics and science policy questions relevant to the brain and behavior of animals including humans.

Specifically, students will learn and be able to:

(numbers refer to the list of *Program Learning Outcomes* for the *Undergraduate Program in Neuroscience and Cognitive Science*)

A.1) Describe the general organization of the brain and its relation to physiological and cognitive processes and explain the fundamental principles of anatomical and functional organization of neuronal circuits and networks underlying the generation and control of behavior. They will analyze the inputs, outputs, and processes of nervous systems from different perspectives, including genetics, cellular and systems-level mechanisms and environmental effects on and shaping of nervous systems.

A.3) Explain common principles of sensory processing across modalities, basic features of the motor systems and sensory-motor integration.

A.6) Summarize contemporary understanding of the biological bases of and the cognitive processes underlying behavior, including sensation, perception, and learning, memory

A.8) Outline evolutionary principles that and explain how innate/genetic factors and environment/experience are understood to interact in nervous system development and evolution

A.11) Explain, at a fundamental level, the common methodologies and experimental designs used in research in neuroscience and behavioral science; evaluate the soundness of the methodological design of descriptive, correlational, and experimental research; design, interpret, and evaluate neurobiological and behavioral experiments; synthesize research findings from the neuroscience literature in the evaluation of questions surrounding the neurophysiology, brain or information processing

CS.14) Explain how perception of the world works and how the brain interprets the world from limited inputs and prior knowledge.

NS.13) Explain how neurons detect and process sensory information, including receptor function, transduction processes, and conduction properties; compare and contrast these processes in various sensory modalities.

NS.14) Describe the anatomical organization and functional properties of the visual, auditory and olfactory and taste systems.

NS.16) Explain how motor behaviors are generated, including the basic anatomy of reflex and descending motor pathways, central pattern generators, and regulation of motor activity by higher order circuits in the brain.

B.1) Think critically about complex problems involving the brain and behavior.

B.2) Develop strategies to solve complex problems creatively and with cognitive flexibility.

B.4) Read and critically evaluate both formal scientific literature and scientific results disseminated through the mass media.

B.5) Effectively communicate (orally and written) the principles and concepts of biological and cognitive sciences to other scientists and to the public.

Absence and Class Participation: Participating in the course and attending lectures and discussion sessions are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings, and you will have to **sign the attendance sheet every Tuesday and Thursday**. The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: https://catalog.arizona.edu/policy/class-attendance-and-participation

Absences may affect a student's final course grade. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class activities, please contact the instructor **as soon as possible**. **Absence of more than 15%** (4 lectures or discussion sessions) **will lead to a grade reduction** of one letter grade; absence of 30% or more (8 lectures or discussions) will lead to an 'F' (failure) grade. Students are expected to **attend class on time and until the end** of the lecture / discussion. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy. Absences pre-approved by the UA Dean of Students (or Dean designee) will be honored (see: https://deanofstudents.arizona.edu/policies/attendance-policies-and-practices). In case that you cannot attend in-person for medical reasons (e.g. if you are immunocompromised or have tested positive for COVID-19), the presentations will be simultaneously disseminated via ZOOM (see **ZOOM link on D2L** course website). However, the camera and microphone may not cover all activities in the classroom properly. Presentations will not be recorded and will **not be available for subsequent viewing**.

Students who feel sick or have any of the **symptoms of COVID-19** are expected to stay at home. Students who need to miss a class, or series of classes, due to illness or the need to quarantine/isolate are responsible for emailing their course instructor, with copy to the **Dean of Students**, to let them know of the need, as soon as possible. There is no need for a medical excuse to be provided for absence of **up to one week**. Students who need to miss **more than one week of class** will be required to provide a doctor's note of explanation to the **Dean of Students**. The Dean of Students' Office will communicate the receipt of the note (with expected end date) out to the relevant faculty, and instructors are responsible for determining adjustments or modifications as appropriate. Students are responsible for completing any work that they might miss due to illness or the need to quarantine/isolate, including assignments, quizzes, tests and exams.

We will not accept exercises that are turned in late!
If you anticipate being absent or are unexpectedly absent, please contact the instructor as soon as possible. *To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or drc-info@email.arizona.edu.* If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

Course Communications: For online communication, please use the official UA e-mail address or email *via* D2L

Grading Scale and Policies: Grades will be based on the oral and written ***presentation of the scientific paper(s)***, and on two ***written exercises***. For these two essays, students can choose from a list of over 400 topics representing the field of Neuroethology. There will be ***no*** written examinations. **Grades** will be assigned as follows: **30%** for the oral paper presentation; **70%** for the two written exercises (**20% for the first one, 50% for the final exercise**).

Letter Grade	Percentage
A	90-100
B	80-89
C	70-79
D	60-69
E	0-59

Accessibility and Accommodations: At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu/) to establish reasonable accommodations

Assessment of learning outcomes is accomplished through grading of the student's individual oral and written contributions.

Assessment of learning outcomes

(numbers refer to the list of *Program Learning Outcomes* for the *Undergraduate Program in Neuroscience and Cognitive Science*)

NSCS 381 *Knowledge-specific outcomes*										
A.1	**A.2**	**A.3**	**A.4**	**A.5**	**A.6**	**A.7**	**A.8**	**A.9**	**A.10**	**A.11**
D, P, WR		D, P, WR			D, P, WR		D, P, WR			D, P, WR
NSCS 381 *Scientific inquiry*						**NSCS 381** *Ethics and professionalism*				
B.1	**B.2**	**B.3**	**B.4**	**B.5**	**B.6**		**C.1**	**C.2**		
D, P, WR	D, P, WR		D, P, WR	D, P, WR			D	D		

D: discussion
E: exams
I: in-class exercises
P: presentations
Q: quizzes
WR: written reports

Required Texts or Readings: The class is **not based on a textbook**. We suggest the following books that provide a good **background**, but no single book will cover all the issues and examples dealt with in class: Günther Zupanc: **Behavioral Neurobiology**. Oxford University Press (2019); Sillar, Pictona and Heitler: **The Neuroethology of Predation and Escape**. Wiley (2016). Any textbook on **Neuroscience** will cover the basic information about the nervous system; most textbooks on **Human Physiology** will give sufficient background about brain and nerve cells. Medical school textbooks on **Human Anatomy and Physiology** give a reasonable introduction into how our brain works. Part of the **behavioral examples** will be covered in books on **Animal Behavior**. If you want to acquire such texts, used books not older than ca. 10 years would be appropriate. Many **online resources** exist about neuroscience, nervous systems, brains and behavior.

Assignments: Schedule/Due Dates: Students will be assigned a topic to be researched and presented in class in an **oral presentation** (ca. 20 – 25 minutes). In addition, there will be **two written exercises**. For each, students will choose a topic and research at least three scientific publications for each topic. The written exercises are due on **March 12 and April 23**, respectively. **Students are expected to start their research early**, and they can ask the instructors or the teaching assistant for advice regarding the written exercise **until one week before the respective due date**. To make sure that students understand and properly follow the guidelines for the written exercises (see below), they will have to submit a brief outline (**preproposal**) of their planned written exercise (their hypothesis, proposed experiment, and references of the papers underlying their ideas) three weeks before the respective written exercise is due (Feb. 20 and April 2, respectively).
The submission of the written exercises is final, and resubmission is not possible. The next sections will provide detail regarding the oral presentation and the written exercises.

Presentations in Discussion sessions
Each student will be assigned a particular topic for their oral presentation. Students will have at least two weeks (typically more) to prepare for their class presentation at a given Thursday Discussion Session. Each student will have to read assigned paper(s) and do additional research (internet, library) on that particular topic. In class, each student will present the results of their research as **a PowerPoint presentation**. Each student presentation will then be discussed in class. To facilitate these discussions, **the presenting student will prepare two questions that all students will then discuss in class at the end of the presentation.** These questions should arise from the respective presentation topic but should go beyond the actual presentation. The questions may be inspiring or provocative and should stimulate the class to think about related questions or potential broader significance of the topic (e.g. potentially related evolutionary, ecological, behavioral, social, medical, technological, etc. aspects).

Some of the papers that students will present in class are written for a relatively broad audience and may not provide much evidence for a particular scientific claim. **It is incumbent on the student to further research their subject matter** so that they will provide an in-depth analysis when they present to the class. More about a particular topic can be researched from additional scientific papers and reliable online resources. If the student presenting a topic has questions to which they cannot find answers themselves, they are expected to **contact** the teaching assistant or instructors **in advance** by email. Please start researching your topic **early** so that you have enough time to answer potential questions and, above all, ample time to put together your presentation. **Do not start asking questions just a few days before you are supposed to present your topic. Start working on your presentation as soon as possible after having been given your topic!**

We ask you to **send us your presentation** (PowerPoint in PDF format or 'handout' PDF format) as an email attachment **at least one day prior** to your assigned presentation date. This way, we can give you advice if we feel that you might consider changing aspects of your presentation.

In addition to our live online sessions, we will also upload our lecture slides and the students' presentations as handouts on the D2L course website ('content' / 'lectures' or 'student presentations') for you to revisit the presentations. Please take your time to go over the slide shows and send us by email any questions that you may have. However, we want to point out that those **handouts are no substitute for attending the in-class lectures and presentation sessions** as the handouts alone will not have all the information that is conferred in the live sessions.

Written Exercises

In addition, each student will have to submit **two written exercises.** These will be due on **March 12 and on April 23**, respectively. For these two exercises, you will choose the topics yourself from the list of abstracts (summaries) of talks and posters presented at the International Congress of Neuroethology, held in Lisbon in 2022 (see: 'Content' / 'General': "AbstractBook ICN 2022"). This congress represents much of the research going on in the field of neuroethology, including work on behavior, brains and neurons of invertebrate and vertebrate animals. You should browse through the abstracts and **find a topic** that you find most interesting (a different topic for each of the two exercises). You will then have to **do your own research** (e.g. online searches of the topics, keywords and/or authors) and come up with some interesting **original publications** in the area of interest. You should also read up on the background of the research, for instance in a review paper that covers the wider context of your research papers, which are often very narrowly focused. Note that the abstracts of the Neuroethology Congress are not abstracts of original publications. You will not find those 'papers' online - these abstracts represent posters and talks and are just meant to help you find interesting topics.

For the written exercises, you will have to read, understand and question **at least three scientific research papers** (one of which may be a review article) on a specific topic of your choice. These are meant to add different aspects to your chosen topic (e.g. different questions addressed, different technical approaches, comparison of different animal species, etc.). In your written exercise, you will review the different approaches and questions of the individual publications and present them in a comprehensive context.

For the exercise, you will be asked to devise a novel experiment that could be performed to test the hypothesis of the papers you read or to test a new hypothesis that you put forward and that is related to the topic that you have been researching. These exercises will require that you not only read the scientific papers of your choice, but that you understand the authors' questions, reasoning, hypotheses, and experimental designs.

Your paper (exercise) will be organized as follows:

In the 1. paragraph, you very briefly summarize the main question/hypothesis and the results /answer of the papers you read.

In the 2nd paragraph, you propose your own hypothesis based on some of the findings of the papers you read. If this seems too difficult, then choose a hypothesis put forward by the paper(s) you read and for which you want to design an alternative experimental test.

In the 3rd paragraph, you design your own experiment that will test the hypothesis you came up with.

In the 4th paragraph, you briefly describe the expected outcome of your experiment and how it would support your hypothesis or answer the specific question that you want to address.

Your written exercises will be about 1000 (850-1100) words (about 1 ½ single spaced pages when using 12-point Times New Roman font) **excluding references**. This will guarantee a level playing field. In the main body of the text, you only give the authors and the year of publication (e.g. 'Doe 2022'), or just a reference number; in the r**eference list** you list all the sources (including websites) that you relied on for your research (and that you refer to in the text). The reference list should be organized **in the same way as the references section in one of the papers** you read (e.g. authors' names, year, title, journal, volume, pages, DOI). **Do not include information about when and from which website you downloaded your papers.**

Write in a succinct and concise way. Omit superficial stylistic elaborations; stay at a factual level (this does not exclude hypothetical assumptions and projections based on facts).

Some points to consider:

- The topic you choose should include at least some aspects of brain / neural / sensory/ motor control of behavior; do not choose a purely ecological or natural history aspect of behavior as your topic.
- Do not choose a medical/psychological topic that involves human subjects. This class is not a medical or psychology class, and you cannot generally experiment on humans.
- Describe your hypothesis clearly.
- Do additional research to find out if your hypothesis has already been tested.
- Do not choose a hypothesis that seems extremely unlikely given the available evidence.
- Suggest controls for your experiments.
- In the main body of the text, do not list the title of the papers you cite (this information is given only in the reference list).
- Base your arguments and information on **original publications** (peer-reviewed articles in scientific journals). **Random websites and blogs are not reliable**

sources of information. If you are in doubt about the suitability of a particular study, please ask the instructors or the TA.

We urge you to start early researching and planning your exercise, even though it may seem easy because it is only 1½ pages long. It will require quite some reading, reasoning and imagination, the result of which will determine the quality of your exercise. We will be happy to answer questions about your chosen papers, but not if you ask them a few days before the exercise is due. As you may be unfamiliar with this kind of exercise, your first exercise will only contribute 20% to your final grade whereas the second one will contribute 50%.

As stated above, students will have to submit a **preproposal** of their planned written exercise (hypothesis, proposed experiment, and references) **three weeks before the** respective **written exercise** is due (**Feb. 20 and April 2**, respectively). If you do not submit your preproposal, your final written exercise will be reduced by 4 points for the first exercise (4 out of 20%) and by 5 points (5 out of 50%) for the second exercise.

The preproposals as well as the final exercises will be uploaded onto the D2L website, where the final exercises will be automatically scanned for plagiarism. The website will not accept submission after the respective deadlines!

To view your graded written assignments in D2L,

1. Click on '**Assignments**' in the navbar.
2. From the **Assignments** page, locate your assignment, and click Unread in the **Evaluation Status** column.
3. From the **View Feedback** page, you can view your submission feedback and grade.
4. Click **View Inline Feedback**. The annotation view opens in a new tab, displaying annotated feedback using highlighting, free hand drawing, shapes, and associated commenting.
5. To download the annotated assignment as a PDF, click Download.

See syllabus for **Scheduled Topics/Activities**

Course website: Information about the course, including the syllabus (and potential upgrades), reading materials, some background information and internet resources of interest will be available on the **D2L website.**
It is the student's responsibility to check the course website regularly for announcements and other important course information.

Classroom Behavior and policies regarding effective learning:
Code of Academic Integrity: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

Exercises have to be written individually. Any **plagiarism** and other kinds of deceit will lead to an 'F' (failure) grade. The University Libraries have some excellent tips for avoiding plagiarism, available at http://new.library.arizona.edu/research/citing/plagiarism

To foster a positive learning environment, students and instructors have a shared responsibility.
Students are expected to **take notes during lectures** and to read and discuss the assigned papers.

Threatening Behavior Policy: The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Life challenges: At the University of Arizona, we strive to make learning experiences as accessible as possible. If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.
If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu/) to establish reasonable accommodations. This course is presented in person. If you have to participate online and you think your **internet access** is too slow to present your PowerPoint discussion contribution, please let us know in advance and we can provide you **fast internet access on campus** in a socially distanced, virus-free environment.

UA Nondiscrimination and Anti-harassment Policy: The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Lab experience: Students interested in hands-on experience may potentially be offered the opportunity to work in Dr. Strausfeld's lab for extra research credits (not related to this class). This will require a substantial time commitment as 'real' projects cannot be accomplished in 2 or 3 hours per week. Because of the time required to learn and perform neurobiological techniques, this is most useful if the commitment extends beyond the semester (summer break, next semester). These projects can potentially turn into long-term, paid research assistantships. Also, check out the Undergraduate Biology Research Program (UBRP): **http://www.blc.arizona.edu/UBRP/default.html**

Honors contract: Honors students may earn honors credit by writing a term paper based on an extensive literature review from a list of offered topics. This paper will be much more comprehensive and will comprise ca. 5000 words. Honors students will meet with instructors repeatedly to discuss the project and its progress online.
The term papers will not be in addition, but instead of the second regular students' exercise, and will be due at the same times (April 20).
On your papers, please note that they are submitted for honors credit.

Subject to Change Statement: Other than the grade and attendance policy, this syllabus may be subject to change with advance notice, as deemed appropriate by the instructors. Any changes of the syllabus will be announced in class and posted on the D2L website.

Confidentiality of Student Records: http://www.registrar.arizona.edu/ferpa/default.htm

Faculty Ownership Rights in Lecture Notes and Course Materials

The instructors hold the copyright in their lectures, lecture slides, quizzes and exams, and other course original materials. This copyright includes student notes or summaries that substantially reflect the instructors' lectures or materials. These materials are made available only for personal use by students, and *students may not distribute or reproduce the materials for commercial purposes without the instructors' express written consent*. (This does not prevent students from sharing notes on an individual basis for personal use.) Violation of the instructors' copyright may result in course sanctions and violate the Code of Academic Integrity.

Writing Help

The University **THINK TANK** provides help with essay writing. Below are some of their offerings and you will find more on their website: https://thinktank.arizona.edu/

Keep in mind that the essays that we expect you to write have a particular format,. If you seek help from the THINK TANK, let them know what we expect you to write in each particular paragraph. This is not an English 101 writing assignment! Getting writing help from the THINK TANK may be a very good idea if you are not sure about your writing skills, but it is not a guarantee that you will receive a good grade for your essay.

The THINK TANK has recently introduced **Feedback Loop**, which enables students to upload a paper rather than attending an in-person session (https://thinktank.arizona.edu/news/2019/10/new-feedback-service-%E2%80%98loops%E2%80%99-students). A tutor will spend about 45 minutes leaving comments in the margins and links to additional resources. This is not a proofreading service but a conversational venue in which the tutors offer suggestions and instructional feedback. **Feedback Loop** employs both graduate and undergraduate student tutors from a wide variety of academic disciplines in an **appointment-based scheduling system**. Tutors take notes after every session and email a copy to the student. These notes can be used as a **"proof of visit"** if you're interested in providing extra credit or otherwise incentivizing students to improve their writing.

- **In person: 30-minute** writing consultations by appointment
- **Zoom: 45-minute** web conferencing sessions by appointment
- **Feedback Loop:** online submission and feedback service
- **Two locations** on campus: **Bear Down Gym** and **Manzanita-Mohave**
- Help with **any kind of writing** (papers, lab reports, resumes, emails, etc.) at **any stage** in the process
- Services for **all UA students**, freshmen to Ph.D. candidates

Rocky Mountain Writing Centers Association

THE UNIVERSITY OF ARIZONA
THINK TANK

Where to go, who to call if you're in crisis:

Located in Tucson? Call the Community-Wide Crisis Line 24 hours a day, 7 days a week at 520-622-6000.

Are you a University of Arizona student? If it is not an emergency and you are a UA student, call or walk-in to Counseling and Psych Services at 520-621-3334 Monday - Friday. Walk-in triage is available between 9 am and 4 pm Monday - Friday.

Are you a concerned friend? Concerned friends can find out more about helping a friend who might be experiencing problems through our Friend 2 Friend website.

Resources for sexual assault, relationship violence, and stalking.

24-Hour Hotlines:

The National Suicide Prevention Lifeline is a 24-hour, toll-free, confidential suicide prevention hotline available to anyone in suicidal crisis or emotional distress. By dialing 1-800-273-TALK (8255), the call is routed to the nearest crisis center in our national network of more than 150 crisis

centers. The Lifeline's national network of local crisis centers provides crisis counseling and mental health referrals day and night.
Crisis Text Line: Text HOME to 741741 from anywhere **in the United States**, anytime, about any type of crisis. A live, trained Crisis Counselor receives the text and responds, all from a secure online platform. Find out more about how it works at crisistextline.org.
Suicide Prevention for LGBTQ Youth through the Trevor Project:

- **The Trevor Lifeline** is a 24/7 suicide hotline: 866-4-U-TREVOR (1-866-488-7386)
- **TrevorChat:** Online instant messaging available 7 days a week, 3 pm - 10 pm ET (12 pm -- 7 pm PT)
- **TrevorText:** Confidential and secure resource that provides live help for LGBTQ youth with a trained specialist, over text messages. Text TREVOR to 1-202-304-1200 (available 7 days a week, 3 pm - 10 pm ET, 12 pm -- 7 pm PT)

Veterans' Suicide Prevention Lifeline: 1-800-273-TALK (1-800-273-8255)
SAMHSA Treatment Referral Hotline (Substance Abuse): 1-800-662-HELP (1-800-662-4357)
National Sexual Assault Hotline: 1-800-656-HOPE (1-800-656-4673)
Loveisrespect (National Dating Abuse Helpline): Call 1-866-331-9474 (TTY: 1-866-331-8453). Text LOVEIS to 22522 - you'll receive a response from a peer advocate prompting you for your question. Go ahead and text your comment or question and we will reply.

NROS 397. VIP-CURE: Brain Communication Networks

Tues 9:30-10:20am (Social Sciences 222) and Two scheduled laboratory hours, BSW 137 (Options: Tues 10:30-11:20, Wed 9-9:50, Wed 11-11:50, Th 9:30-10:20, Fri 10-10:50, Fri 11-11:50)

Description of Course

VIP-CUREs are research experiences where students work in teams to make discoveries while earning credit. As a group, our objective in this VIP-CURE is to predict and test candidate brain proteins participating in neuron-glia communication, aging and neurodegenerative disease. Students will learn computational approaches for "big data" analysis to generate a list of gene candidates, followed by the evaluation of these candidates in Drosophila (fruit flies) with locomotor behavioral readouts. Students will gain real research experience using hand-on techniques and will contribute to new knowledge about the way neurons and glia communicate in health and disease. In addition to technical skills and knowledge, students develop professional skills such as technical writing, communication, and teamwork. Students may take this course in multiple semesters and continue on projects or choose new teams each semester to develop parallel skills.

Course Prerequisites or Co-requisites

Freshman Biology or equivalent OR Introductory Computer Science or Bioinformatics course or experience. Students may enroll for up to three semesters.

Teaching Team and Contact Information

Instructor: Dr. Martha Bhattacharya, Associate Professor, Department of Neuroscience

Pronouns: She/Her/Hers

Email: marthab1@arizona.edu

Office: Gould-Simpson 612

Office Hours: Wed 1-2pm or by appt (zoom or in person)

TA: Reed Bjork, PhD Candidate (Miller Lab)

Email: bjork2@arizona.edu

TA: Michelle English

Email: menglish2@arizona.edu

TA: Kelci Hodgkinson

Email: kelcihodgkinson@arizona.edu

Online info: We will use D2L, OneDrive, and Discord in this class.

Communication: All formal announcements will be through D2L. Students will also have access to a Discord server to communicate with peers and instructors.

Google Drive will be used for our running class agenda.

Course Format and Teaching Methods

Workshop format. 1 hour per week (Tuesday 9:30-10:20) will be in a classroom, while the other two hours will be in the laboratory space (BioSciences West 137).

This class is taught in an in-person format, and attendance is mandatory. Attendance will be taken at all team meetings and lab sections via scan or sign-in. Please see attendance policy below for details.

Course Objectives

During this course, students will:

1. Identify candidate proteins participating in transcellular communication in the brain that go awry in aging or neurodegenerative disease.
2. Test their predictions using behavioral assays in Drosophila and/or by evaluating TDP43 aggregation using microscopy.
3. Hone their writing, presenting, and analysis skills through team activities inside and outside the classroom.

Expected Learning Outcomes

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

1. Use databases to find information relevant to gene of interest
2. Work as a productive member of a research team to assign tasks, coordinate data collection, and accomplish team goals.
3. Handle and cross fruit flies in the laboratory, and evaluate their behavior with multiple methods.
4. Synthesize data and present results to others, following ethical data principles.
5. Keep a detailed notebook and document your progress on a research project.

These learning outcomes align with NSCS learning outcome of Scientific Inquiry, including all sub-outcomes B1 (critical thinking), 6 (problem solving), B3 (engaging in discovery), B4 (reading literature), B5 (effective communication), and B6 (analysis and computation). In addition, this course teaches Ethics and Professionalism in data collection and presentation (C1).

This course is also appropriate for students in other majors whose curricula share a focus on building scientific inquiry skills, including other biological sciences disciplines and bioinformatics. Outcomes of this course may be applicable to specific learning and program outcomes in those majors.

Course Communications

D2L and email are the primary means of communication for our class. Students may also use our class's Discord site here: https://discord.gg/6fnf9Ft3 for communication within your group.

Required Texts or Readings

We have a sourcebook of essential information for success in the NROS 397 course. This will be provided in digital format, and will be available as a hard copy in the laboratory if needed for quick reference. You must read and will be quizzed on this through D2L two weeks into the course.

Articles pertaining to our research topic, ALS, will be assigned throughout the class. These will be announced in class and posted in D2L. Protocols for research work will also be posted as needed for work in the lab.

Required or Special Materials

Students will occasionally need their chemistry lab coats and goggles for some work with chemicals in this course. Students who have not purchased these items for their chemistry labs will be required to acquire these essential safety supplies through the bookstore or by other means. You will be notified if you need to bring these to the lab.

Students will need a laptop or tablet for note-taking and logging experimental details while in the lab.

Assignments: Types, Schedule and Due Dates

1. Participation. This is the biggest portion of your grade and incorporates: (1) attendance, (2) engagement, (3) effort, and (4) teamwork.
2. Individual Notebook (weekly, due Mondays 9:30am): Tasks and weekly reflections should go in this notebook, updated individually by Monday 9:30am of that week. In each weekly reflection, unless otherwise specified, please address the following points (this is the "standard prompt"):

1) What did you accomplish this week? Please be as specific as possible.
2) What struggles or obstacles did you encounter? What solution did you use to overcome the problem? How might you change things in the future to minimize the problem(s)?
3) What do you think is the next step, based on what you accomplished this week?
4) What help do you need from the instructor/TA to help you make progress?

2. Group Lab Notebook: Procedures and Data should go in this notebook, and it should be updated each lab session by students participating in the lab. These should be complete for each week by the last lab session (or by Friday at 5pm) with everything done during that week by the team. These will be assessed four times during the semester for completeness and detail.
3. Homework: There will be weekly assignments outside of class. Examples include completion of a module on Datacamp, reading the sourcebook (and being quizzed on it), completing background research on your pathways, creating graphs for your group's data, etc. Assessment of these is entirely through completion – you either get all the points or you get none of the points. These assignments will be announced on Tuesday mornings in class and on the Class Outline, and they will be due on Mondays 9:30am (24 hrs before the next class) unless otherwise noted. To make sure you complete these assignments, various methods will be used (for example, infinite quiz takes, Datacamp logs, summarize a reading in your individual notebook).
4. Presentations (two): Mid-semester, each group will present their crosses and interim data generated in the lab. At the end of the semester you will give a team presentation about your progress and use your Wiki page.
5. Surveys and evaluations: These are designed to ensure that the course is meeting learning objectives. A pre-course and post-course survey are required of all students. You may also be asked whether this information, in an anonymous format, can be used in an educational research study evaluating this model of engagement in Neuroscience. Your participation in the research study will not affect your grade on this assignment.

The full breakdown of how grades are calculated is shown below.

Activity	Points	Number	Drop	Total
Individual Reflections	5	13	1	60
Lab/Team Notebook	20	4	0	80
Participation	5	13	1	60
Homework Activities	5	13	1	60
Mid-Semester Presentation	25	1	0	25
Final Wiki and Team Pres	40	1	0	40
Informal Surveys (Start, End)	10	2	0	20
Peer Evaluation	30	1	0	30

TOTAL				**375**

***Drop: indicates that one week's assignment and/or participation can be dropped. The instructor strongly encourages you to reserve this drop for unexpected illness or other emergencies, as it cannot be granted twice.

Mid-Semester Update

Each group will present their progress, methods, crossing plan, and any early results in a brief presentation to the class on the Tuesday of the week before spring break (2/27/24). Each team will have ~5 minutes (5 slides).

Final Examination or Project

The final assignment is a Wiki page where your group will create a visual summary of your results and progress (a detailed rubric will be provided). This will be due on April 30th, the last Tuesday of class.

Grading Scale and Policies

Your grade is based on four areas, shown below. Each student may work on different areas and contribute differently, so each student's grade will be uniquely evaluated based on their contributions and completion of the items below. Grades are on A-E scale and are broken down as follows:

Percent Range	Letter Grade
90-100%	A
80-89.5	B
70-79.5	C
60-69.5	D
59.5 or below	E

Incomplete (I) or Withdrawal (W):

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

Dispute of Grade Policy

Grades on work can be disputed if brought to the instructor within one week (7 days) of the return of the assignment.

Scheduled Topics/Activities

As this is a discovery-based laboratory class, the pace of class activities will depend on the results of previous activities. Thus the schedule cannot be fully set in advance. The current predicted schedule of activities in the classroom and laboratory is posted on D2L.

Team Notebook Contents - Suggested

Notebook Essentials	
Notebook Maintenance	Title of Notebook: Descriptive Title, Name, Semester (Spring 2021)
	Each Entry is Dated
To-Do List Maintenance	Maintain check-boxes for items to be done that are then checked off and dated when done.
Class Notes, Meeting Notes	Detailed meeting notes;
	Check-boxes for items for which you are responsible;
	Deadlines for your subteam and the overall team.
Technical Notes	Detailed Information about Decisions Made in Process
	Notes on which version of software you have used
	Links to code or copies of important scripts
	Records of important websites;
	Your ideas, even if they are still in early stages. (Brainstorming is good! Ask and answer questions for yourself to document your thinking.)
Usability	Your VIP notebook needs to be of use to people who join the team later and need to refer to it. This includes legibility, intelligible technical and meeting notes, and overall organization.

Absence and Class Participation Policy

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop

Specific to this course: Attending laboratory and workshop sessions are vital to the learning process. Furthermore, because work will be done in teams, team communication that occurs during class is essential. As such, attendance is required at all Tuesday meetings and at your assigned lab section. Absences will affect a student's final course grade because you will lose participation points for that week. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class online activities, please contact me as soon as you are able. Provided you make this effort to communicate with me about absences, I will work with you to ensure you are able to keep up with course activities.

Classroom attendance:

- If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify your instructor(s) if you will be missing a course meeting or an assignment deadline.
- Non-attendance for any reason does **not** guarantee an automatic extension of due date or rescheduling of examinations/assessments.
- Please communicate and coordinate any request directly with your instructor.
- If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
- Voluntary, free, and convenient COVID-19 testing is available for students on Main Campus.

- COVID-19 vaccine is available for all students at Campus Health.

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.

To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or drc-info@email.arizona.edu. If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, **https://drc.arizona.edu/**) to establish reasonable accommodations.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.

The University Libraries have some excellent tips for avoiding plagiarism, available at http://new.library.arizona.edu/research/citing/plagiarism.

Nondiscrimination and Anti-harassment Policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

Academic advising: If you have questions about your academic progress this semester, please reach out to your academic advisor (https://advising.arizona.edu/advisors/major). Contact the Advising Resource Center (https://advising.arizona.edu/) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@.arizona.edu

Life challenges: If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at (520) 621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges: If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

UA Academic policies and procedures are available at http://catalog.arizona.edu/policies

Campus Health
http://www.health.arizona.edu/
Campus Health provides quality medical and mental health care services through virtual and in-person care.
Phone: 520-621-9202

Counseling and Psych Services (CAPS)
https://health.arizona.edu/counseling-psych-services
CAPS provides mental health care, including short-term counseling services.
Phone: 520-621-3334

The Dean of Students Office's Student Assistance Program
http://deanofstudents.arizona.edu/student-assistance/students/student-assistance
Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services.
Email: DOS-deanofstudents@email.arizona.edu
Phone: 520-621-7057

Survivor Advocacy Program
https://survivoradvocacy.arizona.edu/
The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.
Email: survivoradvocacy@email.arizona.edu
Phone: 520-621-5767

Preferred Gender Pronoun

This course affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is on the class roster, please let me know. Feel free to correct instructors on your preferred gender pronoun. If you have any questions or concerns, please do not hesitate to contact me directly in class or via email (instructor email). If you wish to change your preferred name or pronoun in the UAccess system, please use the following guidelines:

Preferred name: University of Arizona students may choose to identify themselves within the University community using a preferred first name that differs from their official/legal name. A student's preferred name will appear instead of the person's official/legal first name in select University-related systems and documents, provided that the name is not being used for the purpose of misrepresentation. Students are able to update their preferred names in UAccess.

Pronouns: Students may designate pronouns they use to identify themselves. Instructors and staff are encouraged to use pronouns for people that they use for themselves as a sign of respect and inclusion. Students are able to update and edit their pronouns in UAccess.

More information on updating your preferred name and pronouns is available on the Office of the Registrar site at https://www.registrar.arizona.edu/.

Safety on Campus and in the Classroom

Familiarize yourself with the Gould-Simpson Evacuation and Active Shooter plans specific to these buildings. To be prepared for emergencies of this nature, please watch the video available at https://ua-saem-aiss.narrasys.com/#/story/university-of-arizona-cert/active-shooter

Confidentiality of Student Records

http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Aug 10, 2023

NROS 412 Learning and Memory, Fall 2023
Course information

Tuesday & Thursday, 3:30 pm - 4:45 pm
R P Harvill Bldg, Rm 305

Description
The course is designed to provide a solid grounding in mechanisms of learning and memory at the molecular, cellular, behavioral level. After all, learning and remembering are properties of an organism that interacts with its environment and requires molecules and neural circuits that can sense, process, and output information via behavior. Only with insights at all levels can one begin to approach a comprehensive understanding of learning and memory. A combination of lectures and discussions of research papers will comprehensively discuss the current state of knowledge regarding the neurobiological basis of learning and memory derived from invertebrate to mammalian model systems. The course will discuss topics including the biochemical basis of cellular information processing, genes and gene regulation in memory formation, the role of long-term changes in synaptic connections for memory, multimodal signal integration at the molecular level and its role in memory, and biochemical mechanisms of information storage.

Course Objectives and Expected Learning Outcome
- To provide you with a solid background of learning theory and synaptic physiology.
- To familiarize you with model systems dissecting molecular and cellular mechanisms of learning and memory.
- To acquaint you with biochemical mechanisms of long-term changes in synaptic function and information storage.
- To familiarize you with the molecular basis of learning and memory disorders.

Recommended Prerequisite(s)
NROS 307 (Neurophysiology), NROS 310 (Cellular Neuroscience)

Course Format
3-unit course with 2 Lectures each week (TR, 2:00-3:15 pm) in SLHS Room205
Lectures, in-class research paper presentations and in-class research paper discussions.

Class meetings
This class is scheduled to be taught exclusively in the in-person modality.
Meeting times and location:
Tuesday & Thursday, 3:30 pm - 4:45 pm
R P Harvill Bldg, Rm. 305

Instructor & Contact Information

Instructor
Konrad E. Zinsmaier, Ph.D.
Professor
Department of Neuroscience and Molecular & Cellular Biology
office: Gould Simpson Bldg., Room 627
phone: 626-1343
email: kez4@arizona.edu

Office Hours
Wednesday from 3:00 – 3:45 pm, Gould-Simpson, Room 401

otherwise: “Electronic Open-Door" policy. Email me for an appointment or answering an otherwise “simple” question. I will try to answer promptly, the latest with 24 hours.

Web Information
Course home page: D2l, https://d2l.arizona.edu/d2l/home/1125390

Email is the official means of communication for this course. For all email communications, please put 412 in the subject line.

Textbook (Recommended - Not Required)
Kandel et al., Principles of Neuroscience, 6th Edition

Additional Readings
Additional readings and learning material will be made available on the D2L website of the course.

Assignment/Testing Schedule/Due Dates

Readings

Selected review articles covering each lecture are provided on D2L.

Student Presentations & Discussions

There will be a total of 7 in-class presentations of research papers by a selected group of students. Each student will participate once in a group presentation of a selected paper (80 points). The intent of these presentations is to stimulate a class-wide discussion on the validity and significance of the obtained results.

Participation

60 points will be earned by attending all in-class presentation/discussion sessions a student didn't present.

Reading & Writing Assignments

Research Paper Summaries: Students are required to read each of the 7 presented research papers ahead of the respective discussion sessions and provide a short summary of key findings (20 points each):

- For each paper, you need to summarize 2-3 key points of the paper in no less than 200 words; a comprehensive summary of the paper is not required.
- For one of those key points, describe or draw out the key piece of data that support that point.

The summaries will be due before the first class at which the paper is presented.

Final Essay: There will be one essay (100 points). The essay is focused on testing hypotheses that students derive from the primary literature that was covered and discussed in class.

Exams

Students must take 2 exams (each 60 points). Exams will be scheduled to be held in person. The format of the exam will be mostly short answer, multiple choice, and multi-select questions. The length of the exam is typically one hour.

- Make-up exams require approval and will only be allowed in cases of well-documented emergencies. Make up exams are likely to be modified from the original.

There is no cumulative final exam.

Required extracurricular activities

None.

The due dates for exams and assignments are listed in the course schedule (D2L homepage) and the D2L calendar.

Grading Policy

Paper presentation	80 points
Participation in discussions	60 points
Written paper summaries (each 20 points)	140 points
Final essay	100 points
Exams (each 60 points)	120 points
Total	500 points

Grade Assignment

A: 90 - 100%
B: 80 - 89%
C: 70 - 79%
D: 60 - 69%
E: <60%.

Regrading Policy

If you believe that there has been an error in grading of an assignment or exam, please contact the instructor who will review the material in question. You must initiate a request for re-grading within 3 weeks of the date on which the grade was posted; otherwise, I will not consider the request.

Attendance Policy

Regular attendance of lectures is considered essential to reach a satisfactory understanding of the course material. Lack of attendance will adversely affect the participation portion of the final grade.

- All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion.

- Absences pre-approved by the UA Dean of Students (or Dean designee) will be honored.
- The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop . The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.

Notify me (kez4@arizona.edu) if you will be missing an in-person session, or if you will miss an assignment deadline.

- Non-attendance for any reason does not guarantee an automatic extension of due date or rescheduling of examinations.
- Please communicate and coordinate any request directly with me (kez4@arizona.edu).

Classroom attendance
The health and wellbeing of everyone in this class is the highest priority. Accordingly, we are all required to follow the university guidelines on COVID-19 mitigation.

- If you feel sick, or if you need to isolate or quarantine based on University protocols, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify your instructor(s) if you will be missing a course meeting or an assignment deadline.
- Non-attendance for any reason does **not** guarantee an automatic extension of due date or rescheduling of examinations/assessments.
- Please communicate and coordinate any request directly with your instructor *(kez4@arizona.edu)*.
- If you must miss the equivalent of more than one week of class, please contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
- Voluntary, free, and convenient COVID-19 testing is available for students on Main Campus.
- If you test positive for COVID-19 and you are participating in on-campus activities, you must report your results to Campus Health. To learn more about the process for reporting a positive test, visit the Case Notification Protocol.
- The COVID-19 vaccine and booster is available for all students at Campus Health.
- Visit the UArizona COVID-19 page for the most up-to-date information.

Equipment and software requirements
For this class you will need access to the following hardware: computer or web-enabled device; regular access to reliable internet signal; ability to download and run the following software: Adobe Acrobat, Word.

Academic advising. If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

Student Code of Academic Integrity
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, students are expected to adhere to the UA Code of Academic Integrity. Graded work (exams and quizzes) must be the product of independent effort unless otherwise instructed. The policies related to issues like cheating and plagiarism will be strictly enforced. Read the full Code at https://deanofstudents.arizona.edu/student-rights-responsibilities/academic-integrity

Classroom Behavior and Classroom Policies Regarding Effective Learning
Individuals in groups can learn best when all are considerate of each other. Therefore, we ask that you please make every effort to make the environment in the classroom conducive to effective learning. This includes such things as turning off your cell phone, only using your laptop for class related activities, refraining from conversation that is not geared toward the topic of the day, arriving on time, and leaving when class is finished. Read the full *Student Code of Conduct* at http://deanofstudents.arizona.edu/studentcodeofconduct

Principle (from the above website). Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. This principle is furthered by the student Code of Conduct and disciplinary procedures established by ABOR Policies 5-308 - 5-403, all provisions of which apply to all University of Arizona students. This Code of Academic Integrity (hereinafter "the Code") is intended to fulfill the requirement imposed by ABOR Policy 5-403.A.4 and otherwise to supplement the student Code of Conduct as permitted by ABOR Policy 5-308.C.1. When you sign your name to your work, you are signing that it is solely your work.

UA Nondiscrimination and Anti-harassment Policy
The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy. Our classroom is a place where

everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Policy against Threatening behavior
The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self.

University of Arizona policies apply and can be found in the following website:
http://policy.web.arizona.edu/~policy/threaten.shtml.

Notification of Objectionable Materials
This course may contain material that may be deemed offensive by some students. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Accessibility and Accommodations
At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, drc.arizona.edu) to establish reasonable accommodations.

Gender Pronoun
It is already UA policy that class rosters are provided to instructors with a student's preferred name. Students may share their preferred name and pronoun with members of the teaching staff and fellow students, as desired, and these gender identities and gender expressions will be honored in this course. As the course includes group work and in-class discussion, it is critical to create an educational environment of inclusion and mutual respect. In this class, to be inclusive of all gender identities and expressions, students will be referred to by their first or last names, the pronoun of their choice, or by default, the pronoun "they".

Confidentiality of Student Records
See http://www.registrar.arizona.edu/ferpa/default.htm

Life challenges
If you are experiencing unexpected barriers to your success in the courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges
If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

The information in this course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor. Any changes to the syllabus will be announced in class and posted on the D2L website

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Where to go, who to call if you're in crisis:

Located in Tucson? Call the Community-Wide Crisis Line 24 hours a day, 7 days a week at 520-622-6000.

Are you a University of Arizona student? If it is not an emergency and you are a UA student, call or walk-in to Counseling and Psych Services at 520-621-3334 Monday - Friday. Walk-in triage is available between 9 am and 4 pm Monday - Friday.

Are you a concerned friend? Concerned friends can find out more about helping a friend who might be experiencing problems through our Friend 2 Friend website.

Resources for sexual assault, relationship violence, and stalking.

Aug 10, 2023

24-Hour Hotlines:

The National Suicide Prevention Lifeline is a 24-hour, toll-free, confidential suicide prevention hotline available to anyone in suicidal crisis or emotional distress. By dialing 1-800-273-TALK (8255), the call is routed to the nearest crisis center in our national network of more than 150 crisis centers. The Lifeline's national network of local crisis centers provides crisis counseling and mental health referrals day and night.

Crisis Text Line: Text HOME to 741741 from anywhere **in the United States**, anytime, about any type of crisis. A live, trained Crisis Counselor receives the text and responds, all from a secure online platform. Find out more about how it works at crisistextline.org.

Suicide Prevention for LGBTQ Youth through the Trevor Project:

- **The Trevor Lifeline** is a 24/7 suicide hotline: 866-4-U-TREVOR (1-866-488-7386)
- **TrevorChat:** Online instant messaging available 7 days a week, 3 pm - 10 pm ET (12 pm -- 7 pm PT)
- **TrevorText:** Confidential and secure resource that provides live help for LGBTQ youth with a trained specialist, over text messages. Text TREVOR to 1-202-304-1200 (available 7 days a week, 3 pm - 10 pm ET, 12 pm -- 7 pm PT)

Veterans' Suicide Prevention Lifeline: 1-800-273-TALK (1-800-273-8255)

SAMHSA Treatment Referral Hotline (Substance Abuse): 1-800-662-HELP (1-800-662-4357)

National Sexual Assault Hotline: 1-800-656-HOPE (1-800-656-4673)

Loveisrespect (National Dating Abuse Helpline): Call 1-866-331-9474 (TTY: 1-866-331-8453). Text LOVEIS to 22522 - you'll receive a response from a peer advocate prompting you for your question. Go ahead and text your comment or question and we will reply.

NROS 415: Electrophysiology Laboratory (3 credit hours)
SYLLABUS

Time and Place: M 1-2:50P, W 12-2:50P (all lab)
All class meetings will be held in Gould Simpson room 404, the electrophysiology teaching lab. You will be given a code for this door, not to be shared with others.

Instructor:
Dr. Charles M. Higgins, Associate Professor, Depts. of Neuroscience / Electrical Engineering
Email: higgins@neurobio.arizona.edu
Office: Gould Simpson 430, not far from the teaching lab
Office Hours: talk to me in lab, or by email appointment

Course format:
Every week the instructor will lead an interactive discussion about whatever you might need to know for present and future laboratory work. The course is in 4 parts of about 4 weeks each, and at the end of each part you will be tested on your practical skills and prepare a short written report. *Your job while in discussion/lab is to prepare yourself for the practical test. Take good notes!* Despite the formal lecture/lab segregation required by the UofA computer system, as the course progresses, you will find that more and more time is spent on laboratory work and *ad-hoc* discussions, and entire periods dedicated to "lectures" completely disappear.

Course Website:
All information about the course, including the syllabus, additional reading materials and assignments will be posted at the course's D2L website. It is your responsibility to check that website regularly to check for announcements and other important course information. Additional information may be found at http://nros415.com.

Course Objectives: This course will provide you with detailed hands-on laboratory experience in recording electrical signals from living cells including more advanced preparations and data analysis.

Expected Learning Outcomes:
At the completion of this course you are expected to understand:
1. Practical techniques for preparing brains for recording
2. Practical use of equipment used for electrophysiology
3. The practical basics of real neuronal function
4. The fundamentals of computer analysis of recorded data

Prerequisites/Corequisites: None

Teaching Format
Discussion/lab at all meetings.

Required Textbook and Other Readings
No text. Readings may be available from the D2L website.

Class Topics

- **Part I: Introduction to the lab, muscle recording and stimulation (4 weeks)**
  1. The basics: electrodes, recording equipment, tools for preparation
     Lab: setting up the lab station
  2. *Sarcophaga bullata*: introduction and anatomy
     Lab: anatomical preparation
  3. Demonstration of preparation
     Lab: muscle recordings and stimulation
  4. Practical exam
- **Part II: Ventral nerve cord recordings (4 weeks)**
  1. Insect ventral nerve cord anatomy
     Lab: anatomical preparation
  2. Demonstration of preparation
     Lab: ventral nerve cord preparation
  3. Processing VNC data
     Lab: Recording and data processing
  4. Practical exam
- **Part III: Central brain (optic lobe) extracellular recordings (4 weeks)**
  1. The insect visual system; optic lobes; visual stimulus creation
     Lab: Anatomical preparation
  2. Visual neuroanatomy, preparation demonstration
     Lab: Central brain recordings
  3. Hook electrode recordings
     Lab: Central brain recordings
  4. Practical exam
- **Part IV: Recordings from humans (skin conductance and EMG) (4 weeks)**
  1. Significance of skin conductance, how it can be measured
     Lab: introduction to skin conductance meter
  2. Electromyograms on humans
     Lab: introduction to EMG recordings
  3. What will elicit a skin conductance response?
     Lab: Fun with higher primates
  4. Practical exam

Grading: Grades will be based on 4 practical exams and 4 lab reports as shown below. **Late reports will lose 20% of their grade every day, or portion thereof, that they are late.**

Practical exam 1	15%
Lab report 1	10%
Practical exam 2	15%
Lab report 2	10%
Practical exam 3	15%
Lab report 3	10%
Practical exam 4	15%
Lab report 4	10%

Letter grades A-E are awarded on standard 10-point thresholds, with 90% or more of the course percentage being an A and 60% or less indicating a failing score. Please note that a section of the course may be canceled if required due to lack of supplies or livestock, thus proportionally raising the worth of other course sections. No late work will be accepted after the semester ends.

Lab report format:
Each lab report must contain the following elements, always keeping in mind that the purpose is to allow others to reproduce your data. **All lab reports must be in PDF format in your appropriate D2L assignment folder. No, Word format is never acceptable!!**

- Organism: Usually *Sarcophaga bullata* (the flesh fly), but later humans!
- Preparation: How did you restrain, dissect, or otherwise prepare the organism for recording?
- Equipment: This section details all relevant settings on the equipment you used (including software settings), and describes whatever you used as an electrode.
- Objective: What were the goals of the experiments you were supposed to perform? What data analysis did you do?
- Results: What experimental data did you collect? What relevant details did you observe? What were the results of your data analysis?
- Discussion: What can you infer from your results/analysis? If something went wrong, what do you think happened, and how could you improve upon it?

Course and University Policies:

- **Attendance**: Since your grade is based on laboratory performance, there is no textbook, and I only demonstrate things once, **it is essential that you attend every class meeting**. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable; **please inform the instructor of any conflicts at the beginning of the semester**. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. The UA's policy concerning class attendance, participation, and administrative drops is available online. Students who miss class due to illness or emergency are required to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences. **The instructor reserves the right to deduct a portion of course credit for repeated tardiness or absence at 5% per missed class period.**
- **Requests for incomplete or withdrawal** must, surprisingly, be made in accordance with the linked University policies.
- **Academic conduct**: Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the University of Arizona Code of Academic Integrity.
- **Threatening student behavior:** The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to oneself. Threatening or disruptive student behavior will not be tolerated in accordance with University policy.
- **Disabilities**: Our goal in the classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let the instructor know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Resource Center to establish reasonable accommodations. If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.
- **Confidentiality of Student Records**: Student records will be kept confidential as required by University Policy and Federal Law.

- **Expected classroom behavior**: University Policy forbids the use of cellular phones and other computing devices during class in cases where it distracts from or disrupts the course. This rule generally still holds true here. However, you are encouraged to use your cellular phone, computer, and any other computing devices that may be nearby, worn on, or embedded in your person to help the class get the answers to discussion questions. This particular use of cell phones is not disruptive.
- **Plagiarism**: I encourage you to look carefully at Prohibited Conduct in the University Code of Academic Integrity, especially where it addresses plagiarism. This seemingly blatant behavior can be more subtle than you might believe. ***Nota bene,*** the policy forbids assisting others to plagiarize. Thus if you provide the results of your experiment to the class on Facebook and it shows up in multiple written reports, you and all of the students who used your data have violated the Code of Academic Integrity.
- **Non-discrimination and anti-harassment**: The University is committed to creating and maintaining an environment free of discrimination. University Policy prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. The University encourages anyone who believes he or she has been the subject of discrimination to report the matter immediately at the link given above.
- If you have really been enjoying the long and ever-growing list of University Policies above, you might want to read the whole list. I'm particularly fond of the Policy on Policies, which is how these keep multiplying.

Faculty Ownership Rights of Lecture Notes and Course Materials:
The instructor holds the copyright to all questions, lectures, slides, quizzes, exams, and any other original course materials, whether in written, electronic, verbal, or any other form. *Class sessions may not be audio- or video-recorded without the instructor's specific written consent*. This copyright includes student notes or summaries that substantially reflect the instructors' lectures, discussions, or materials. These materials are made available only for personal use by students, and *students may not distribute or reproduce the materials for commercial purposes without the instructor's specific written consent*. This does not prevent students from sharing notes on an individual basis as protected by the "fair use" doctrine of copyright law. Violation of the instructors' copyright may result in course sanctions and violate the Code of Academic Integrity.

Subject to Change Statement:
Information contained in this syllabus may be subject to change with advance notice, as deemed appropriate by the instructor. Any changes to this syllabus will be announced in class and posted on the D2L Website.

NROS 418 (online): Fundamental principles in systems neuroscience

Spring 2024 (updated 12/6/2023)

Course Information

Course Objectives

This course approaches the study of neural systems by analyzing and comparing common but critical neurophysiological features that underlie the functioning of and interactions among various neural systems. Our materials will include the primary literature to delve into the nature of these functionalities within the context of specific systems as well as brain properties that overlay and coordinate system functions.

Expected Learning Outcomes

You will be able to:

1. Explain how neurons detect and process sensory information, including receptor function and transduction processes. Compare and contrast these processes in various sensory modalities.
2. Describe the fundamental anatomical organization (include diagrams) and functional properties of the visual, auditory, olfactory, taste, and somatosensory systems.
3. Explain how motor behaviors are generated, including the basic anatomy and function of the reflex circuits, the descending motor pathways, the central pattern generators, and the higher order brain circuits in regulating movement.
4. Explain how brain rhythms and diffuse modulatory circuits affect functioning of the nervous system.
5. Describe the fundamental anatomical organization (include diagrams) and network function of the circuits responsible for common behaviors such as eating, emotion, and social interactions, understand how these circuits integrate sensory information and control movement outputs.
6. Predict the consequences of lesions within the neural pathways, understand the mechanism and affected nervous system in common neurological diseases such as Parkinson's diseases, anxiety and depression.

Course schedule and topics

First 7-week session: 01/10/2024 - 03/01/2024

2024

JANUARY

Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

FEBRUARY

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29		

MARCH

Su	Mo	Tu	We	Th	Fr	Sa
					1	2

Study guides due every Thursday (highlighted in yellow); exam days highlighted in cyan.

Suggested study schedule

Weeks	Lecture	Contents (recorded videos)	Quiz	Study guide due
Week 1	1	Course introduction	2	
	2	Fundamentals of neural circuits	3	1 (1st Thu) 1/11
	3	Visual system 1 – retina	5	
	4	Visual system 2 – receptive field	1	
	5	Visual system 3 – visual pathway	2	
Week 2	6	Visual system 4 – cortex and perception	3	
	7	Visual system 5 – wiring and plasticity	1	2 (2nd Thu) 1/18
	8	Auditory system 1 – hearing structures	3	
	9	Auditory system 2 – neural pathway	5	
	10	Auditory system 3 – sound location	2	
Week 3	11	Olfactory system	3	
	12	Taste	2	3, 4 (3rd Thu) 1/25
	13	Somatosensory system 1 – peripheral	3	
	14	Somatosensory system 2 – pathway	3	
	15	Somatosensory system 3 – cortex	3	
Week 4	16	Pain	4	
		Study for exam		5,6 (4th Thu) 2/1
		Midterm exam covers contents in lecture 1-16		2/2
	17	Peripheral motor system 1 – muscle control	3	
	18	Peripheral motor system 2 – motor neuron and reflex	3	
Week 5	19	Spinal motor system 1 – Rhythmic movement	3	
	20	Spinal motor system 2 – CPG mechanism	3	7 (5th Thu) 2/8
	21	Brain motor system 1 – descending pathways & cortex	3	
	22	Brain motor system 2 – motor control & cerebellum	2	
	23	Brain motor system 3 – basal ganglia	4	
Week 6	24	Visceral and Autonomic nervous system	3	
	25	Neuromodulation	3	8 (6th Thu) 2/15
	26	Emotion & Learned fear	3	
	27	Fear extinction & Innate fear	3	
	28	Stress response 1 – HPA/HPG axis	3	
Week 7	29	Stress response 2 – chronic stress	3	
	30	Gut-brain axis & Microbiota	3	9 (7th Thu) 2/22
	31	Motivated behaviors 1	3	
	32	Motivated behaviors 2	3	
	33	Social and sexual behaviors	7	
Week 8 (half)		*Study for exam*		10 (8th Thu 2/29
		Final Exam covers contents in lecture 17-33		3/1

Course Description

This course will provide a principle understanding of how neural systems encode sensory information and form perceptions of the external world, make decisions, and generate movements, and control behaviors and other physiological processes by description and analysis of neural circuits.

Credit. 3 units. Per University policy, on average, students should expect up to 2 hours of work out of class for each hour in class.

Teaching Methods and learning Process

- The course materials will outline the main points of the course and the students are expected to study them in detail by referencing the related textbooks.
- Assignments every week.
- There will be a short quiz (expected to finish in less than 5 min) in every lecture.
- There will be **no discussion sessions.**

Required Competencies - Course Prerequisites or Corequisites

This course assumes that you have a strong grounding in the fundamentals of cellular neurophysiology and that you have completed your chemistry and physics pre-requisites. You are responsible for reminding yourself of this material as needed. Classes will include lecture as well as small-group discussions and small projects/problem-solving exercises.

Pre-requisite courses: NSCS 200, NROS 307, Chemistry, Physics
Recommended: NSCS 315B

Measurable Module/Unit Learning Objectives

There will be three modules:

Module 1: Sensory system

1. Describe the major neural circuits components of the visual, auditory, taste, olfactory, and somatosensory systems.
2. Explain how the physical stimuli for each sensory system (light/photon for vision, sound for hearing, chemicals for taste and olfaction, and multiple stimuli for somatosensation) are translated to the membrane potentials of the nervous system.
3. Explain the basic principles of how the sensory information are encoded and transferred by the sensory neural pathways.
4. Explain how the sensory processing will be affected if certain neural component of the sensory system was impaired.

Module 2: Motor system

1. Describe the major neural pathways of the motor system from cortex to muscles.
2. Describe the function of the major brain regions in motor control.
3. Explain how the movement problem of Parkinson's Diseases are regulated by the basal ganglion and list the possible therapeutic strategies.

Module 3: Behavioral system

1. List the basic neural pathways from sensory inputs, central processing and motor outputs of emotion, stress response, feeding and social interaction behaviors.
2. Describe the major experimental approaches to study the anatomy and function of the neural circuits for behaviors.

Materials and Technical/Computer Information

Texts or Readings

Besides the course materials posted on D2L, we recommend these textbooks for reference

1. Kandel, ER. *et al*. (2021) *Principles of Neural Science* 6th edition. New York: McGraw Hill Medical. ISBN 9781259642234. Note: a previous version (5th edition, 2013) can also be used, the electronic version of this book (5th edition, 2013) is available to students in UA library. Note: this textbook is the most comprehensive reference book, but it contains much more information than is covered the course.
2. Luo, L (2020) *Principles of Neurobiology*. New York: Garland Science. ISBN 9781003053972. Note: this is a relatively concise textbook focusing on key experiments.
3. Bear, MF. *et al*. (2016) *Neuroscience: Exploring the Brain, 4th Edition*. Philadelphia: Wolters Kluwer. 978-2-36110-080-3.
4. Purves, D. *et al*. (2018) Neuroscience 6th edition. New York: Oxford University Press. ISBN 9781605353807.

Required or special materials

None

Grading Information

Grading Scale

You are expected to attend and actively participate in every phase of the course. Final grades will be based on total points. Your grade for each assignment will be posted in D2L.

Total possible points:
A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%

Assignment	Points	~% of Final Grade
Quizzes: (100@1 point each)	*100*	*20%*
Study guides assignment: 10 study guides in total; each varies in the number of questions; 100 questions in total; 2 points per question;	*200*	*40%*
Mid-term exam	*70*	*14%*
Final exam	*130*	*26%*

Grading Policies

Late assignments
Assignments turned in up to a day late (from the posted deadline) will lose half of the possible points available. Without permission given before the posted deadline, assignments will not be accepted more than 1 day late.

Re-grading policy

If you believe that there has been an error in grading of an assignment, quiz or exam, please contact the instructor who will review the material in question. *You must initiate a request for re-grading within 1 week of the date on which the grade was posted*, otherwise we will not consider the request.

Assignment Information

Required Examination and papers

Study guide questions will be posted on D2L (see D2L-Contents: **Quizzes**/ ***Study guides***). It will require readings from class lectures (PPT file with brief text will be posted on D2L), textbooks by Kandel, Luo or Bear or Purves, and occasionally from other sources. You may use the textbooks, online resources (vetted sources), or material found on PubMed. See the end of this document for how to locate an article on PubMed if you do not already know how to do so. Study guides will have multiple choice answers. The length of study guides varies, some will have fewer, others more questions, depending on the respective topics. ***Study guides must be turned in (D2L) on the due date indicated on the class schedule. You have 6 days to work on each study guide*** (see suggested study schedule above). The study guides differ in length, as do the lectures. Some study guides cover only one lecture or one topic, while most others cover several topics and have more questions to answer.

Quizzes. Quiz questions are embedded in the recorded lectures. There are usually 2-3 quiz questions in each lecture.

Exams. A ***mid-term and a final exam*** will be posted on D2L (see D2L-Contents: **Quizzes**). The mid-term exam will have fewer questions and yield fewer points than the final exam (see table above). This way you will have a better idea about what to expect for the final, and more important, exam. All exam questions will have multiple-choice answers. Unlike the Study guides, these exams are **not 'open book'**; you will have a **limited time** to answer the questions based on what you have learned. You might consider taking notes for each section (lecture, lecture slides) and/or when you are working on your study guides. Those notes may be helpful for the exams because you cannot go back to watch the previous lectures or slides during the exams.

Required extracurricular activities

Not applicable

Final Exam or Project

See class schedule

Course and University Policies

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Nondiscrimination and Anti-harassment Policy

University Policy 200E on prohibited behaviors: http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Class Participation and Absence Policy

Accessibility and Accommodations: At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu) to establish reasonable accommodations.

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences

Accommodations for students with disabilities

Statement for reasonable accommodations provided by the Disability Resources Center: drc.arizona.edu/instructors/syllabus-statement

Subject to Change Statement

Information contained in the course syllabus, other than grade and course policies, may be subject to change with advance notice, as deemed appropriate by us. Any changes to the syllabus will be announced in class and posted on the D2L website.

Academic Integrity policy

Student Code of Academic Integrity that prohibits plagiarism: deanofstudents.arizona.edu/policies-and-codes/code-academic-integrity

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How to find an article on PubMed

Go to the UAz website→academics→libraries→health sciences library→databases→click on the P in the list of alphabet letters→scroll down to PubMed (HSL)→type in whatever you are looking for.

You can type in a doi, a PMID, an author's last name (if there are several authors, type in the last names of several of them), an article title, or simply key words. Once you have clicked search, you can further specify some limits, like you want a review in the last 5 years or the species of animals or clinical trials, etc.

Once you find an article you want in the list, click on the title which usually will bring you to a page with the title, authors, journal, and abstract. Up in the right-hand corner, you will find some buttons to get the full article. Usually all of them will work, but sometimes only one will. Click on one of the buttons. Somewhere on the page that comes up you will find a button that says "pdf". Click on that. You'll usually get an html version of the pdf. If so, click on the page icon on the top right to download the pdf, and save that version. *These articles are all free.*

Occasionally, you will run into as article for which the UA system does not have an institutional subscription. Not to worry. Go back to the database page and click on "request materials" →interlibrary loan. That will get you to a page to type in the info needed for the library to go out on its network to find you a copy. Within a couple of days, sometimes even the same day, you will get an email with a link to a pdf.

Neuroscience of Survival

Fall 2023

Instructor: Dr. Melville Wohlgemuth
Email: wohlgemuth@arizona.edu
Office: GS-636
Office hours: send an email and we will figure out a time to meet (either zoom or in person)
Telephone: 520-621-6640

Required textbook: The neuroethology of predation and escape
(http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470972246.html)

Class meeting time: Tuesdays and Thursdays, 9:30-10:45AM
Class meeting place: Cesar Chavez Building, Rm 316

Course description: Receiving and responding to environmental stimuli are fundamental components in a wide variety of behaviors, including the critically important behaviors of finding prey and avoiding predation. In this course, we will examine both invertebrate and vertebrate systems to understand how organisms use sensory systems to detect prey and predators, and how motor systems to guide appropriate actions. We will begin by examining predator/prey interactions mediated through vision, followed by olfaction, audition and electrolocation. The course will then cover escape and predatory behaviors for a wide variety of organisms. For each topic, we will first discuss sensing behaviors, the neural machinery of sensory systems, and how sensory signals are used to guide species-specific escape and attack behaviors at the levels of the central and peripheral nervous systems.

Course prerequisites: NSCS 307, Cellular Neurophysiology

Course website: All information about the course, including the syllabus, additional reading materials, lecture slides, and homework assignments, will be posted at the course's D2L Website. It is the student's responsibility to check the website regularly to be updated on announcements and other important course information.

Course format: 2 classes per week; one class is a lecture, one class is student presentations on original research articles.

Course objectives:

- To impart the importance of behavioral studies to a complete understanding of nervous system function for biologically-relevant tasks.
- To demonstrate that the study of specialized animal systems can lead to a broad and deep understanding of nervous system function and separate species-specializations from general function.
- To foster critical analysis of original research and hypothesis testing, and the skills to convey this information to a general audience through writing and oral communication.

Expected learning outcomes:

At the completion of this course students are expected to understand:

- The sensory transduction processes for vision, olfaction, audition, and electrolocation
- How sensory experiences inform adaptations to both predatory and defensive behaviors
- Quantitative evaluations of behavior and how this leads to predictions about underlying neural circuits
- How different pharmacological agents act in the nervous system, and their use for predatory and defensive behaviors
- This course contributes to the following learning objectives for the NSCS major (see NSCS website for more details):
    - A1, A3, A8, A11, NS13, NS14, NS16, NS17, NS18, B1, B3, B4, B5, and C1

Course organization and assignments:

In this course, we will read and discuss textbook chapters and review articles in conjunction with original research articles. Students will sign up for a topic at the beginning of the semester, and they will choose an article from a list provided by the instructor. For each topic we cover, students will present a detailed oral and written report on research articles. There will also be three (3) quizzes and one midterm examination.

Overview of course requirements:

- Weekly readings from texts and original research articles. NOTE: All reading assignments are to be completed before the class date listed on the syllabus
- Two oral reports in class and written critique paper (3-4 pages, ~double-spaced) on an original research article. The paper is due by 5:00 p.m. one week following the presentation. Each report should include:
    1) A concise summary of the conceptual framework for the research report.
    2) The hypothesis being tested.
    3) A clear description of the experimental design and methods
    4) A summary of the results
    5) An overview of the interpretation of the research findings
    6) A critical assessment of points discussed in 1-5
    7) Concrete suggestions for future experiments on topics covered in the article
- Weekly Think-Pair-Share: written questions on readings due on Sundays at 5:00 PM.
- Quizzes (3): 10 minutes at the beginning of class.
- Midterm: on October 11, will cover text and lecture material covered up to Week 7 (Chapters 1-7)
- Final research project proposal: Mock research proposal (~5 pages) for an experiment in the field of neuroethology. The research proposal format should include an introduction explaining the important background and framing the question to be addressed, a detailed methods section, a section with predicted results and possible pitfalls, and a discussion of the broader implications of the outcomes. You will have the opportunity to develop your ideas for the project in class and in discussion with the instructor.

Course grades will be based on the following:

- Quizzes: 15%
- Reviews/critiques of research articles; oral (5%) and written (10%): 15%
- Think-pair-share: Preparation of written questions; Discussion: 15%
- Midterm exam: 20%
- Final Project Research Proposal; oral (10%) and written (25%): 35%
- Grading criteria:
  A = 90-100 %
  B = 80-89 %
  C = 70-79 %
  D = 60-69 %
  F < 60%

Absence and class participation policy (new guidance with respect to COVID):

- If you feel sick, or may have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify your instructor(s) if you will be missing a course meeting or an assignment deadline.
- Non-attendance for any reason does not guarantee an automatic extension of due date or rescheduling of examinations/assessments.
    - Please communicate and coordinate any request directly with your instructor.
- If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
- Voluntary, free, and convenient COVID-19 testing is available for students on Main Campus.
- COVID-19 vaccine is available for all students at Campus Health.
- Visit the UArizona COVID-19 page for regular updates.

- Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Absences may affect a student's final course grade. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class online activities, please contact me as soon as possible. To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or drc-info@email.arizona.edu. If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.
- The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop
- The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.
- Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences
- If students register for the course late, they will be given an opportunity to make up the missed work.

Classroom behavior policy:

- To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).
- Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Threatening behavior policy

- The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.
- The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy.
- Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.
- Please be aware that UA faculty and instructors who work with students are required to report allegations of sex discrimination to the Title IX Office. This means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking that involves another student or employee, or that happens on campus or in a UA program, I must share that information with the Title IX Coordinator. Although I have to make that notification, you will have choices regarding whether or not you want to pursue a formal complaint against anyone on campus. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.
- If you wish to speak to someone privately, you can contact any of the following on-campus resources:
    - Counseling & Psych Services (CAPS), https://health.arizona.edu/counseling-psych-services, 520-621-6490, 520-570-7898 (after hours)
    - Oasis Sexual Assault, Relationship Violence, and Trauma Services, https://health.arizona.edu/counseling-oasis (same phone as CAPS)
    - Campus Health, https://health.arizona.edu/home, (520) 621-6490
    - University of Arizona Ombuds, https://ombuds.arizona.edu/, (520)-626-5589
    - Title IX section on sexual assault support & resources (https://titleix.arizona.edu/title-ix/sexual-harassment-violence) has more information, as well as a link explaining options if you have a concern, need assistance/support, or would like to file a complaint.

Academic integrity policy

- Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity.
- The University Libraries have some excellent tips for avoiding plagiarism, available at http://new.library.arizona.edu/research/citing/plagiarism.

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Overview of course schedule, assignments, and due dates

Date	Readings	Assignment	Assessment
Aug 22	Week 1	Class Introduction	
Aug 24	Week 1	Ch. 1 – Visual predators	
Aug 29	Week 2	Ch. 2 – Olfaction	
Aug 31	Week 2	Paper Presentations	
Sep 5	Week 3	Ch. 3 – Avian Hearing	
Sep 7	Week 3	Paper Presentations	
Sep 12	Week 4	Ch. 4 – Mammalian hearing	
Sep 14	Week 4	Paper presentations	Quiz 1
Sep 19	Week 5	Ch. 5 – Bat echolocation	
Sep 21	Week 5	Paper presentations	
Sep 26	Week 6	Ch. 6 - Electrolocation	
Sep 28	Week 6	Paper presentations	
Oct 3	Week 7	Ch. 7 – Crustacean escape behaviors	
Oct 5	Week 7	Paper presentations	
Oct 10	Week 8	**EXAM**	Midterm
Oct 12	Week 8	Final Project Discussion	Project Draft
Oct 17	Week 9	Ch. 8 – Prey escape for fish	
Oct 19	Week 9	Paper presentations	
Oct 24	Week 10	Ch. 9 – Startle Response	
Oct 26	Week 10	Paper presentations	
Oct 31	Week 11	Ch. 10 – Archer fish	Quiz 2
Nov 2	Week 11	Paper presentations	
Nov 7	Week 12	Ch. 11 – Catapults	
Nov 9	Week 12	Paper presentations	
Nov 11	Week 13	Ch. 12 – Molluscan defense	
Nov 16	Week 13	Paper presentations	Quiz 3
Nov 20-24		Thanksgiving	
Nov 28	Week 14	Ch. 13 – Neurotoxins	
Nov 30	Week 14	Final project presentations	
Dec 5	Week 15	Final project presentations	

Paper Presentations for each Week

Week 2 Presentations: Chapters 1-2

Mischiati, Matteo, Huai-Ti Lin, Paul Herold, Elliot Imler, Robert Olberg, and Anthony Leonardo. "Internal models direct dragonfly interception steering." Nature 517, no. 7534 (2015): 333-338.

Wesson, Daniel W., and Donald A. Wilson. "Smelling sounds: olfactory–auditory sensory convergence in the olfactory tubercle." The Journal of Neuroscience 30.8 (2010): 3013-3021.

Poo, Cindy, Agarwal, Gautam, Bonnacchi, Niccolo, Mainen, Zachary. (2022) "Spatial maps in piriform cortex during olfactory navigation." Nature (601): 595-599

Pappas, T. C., Motamedi, M., & Christensen, B. N. (2004). "Unique temperature-activated neurons from pit viper thermosensors." American Journal of Physiology-Cell Physiology, 287(5), C1219-C1228.

Week 3 Presentations: Chapters 3

Brainard, M. S., & Knudsen, E. I. (1998). "Sensitive periods for visual calibration of the auditory space map in the barn owl optic tectum." Journal of Neuroscience, 18(10), 3929-3942.

Asadollahi, Ali, Shreesh P. Mysore, and Eric I. Knudsen. "Stimulus-driven competition in a cholinergic midbrain nucleus." Nature neuroscience 13.7 (2010): 889-895.

Week 4 Presentations: Chapter 4

Ito, Shinya, Yufei Si, David A. Feldheim, and Alan M. Litke. "Spectral cues are necessary to encode azimuthal auditory space in the mouse superior colliculus." Nature communications 11, no. 1 (2020): 1-12.

Middlebrooks, J. C., & Knudsen, E. I. (1984). "A neural code for auditory space in the cat's superior colliculus." Journal of Neuroscience, 4(10), 2621-2634.

Week 5 Presentations: Chapter 5

Valentine, Doreen E., and Cynthia F. Moss. "Spatially selective auditory responses in the superior colliculus of the echolocating bat." The Journal of neuroscience 17.5 (1997): 1720-1733.

Hechavarría, Julio C., et al. "Blurry topography for precise target-distance computations in the auditory cortex of echolocating bats." Nature Communications 4 (2013).

Week 6 Presentations: Chapter 6

Catania, Kenneth. "The shocking predatory strike of the electric eel." Science 346.6214 (2014): 1231-1234.

Vonderschen, K., & Chacron, M. J. (2011). Sparse and dense coding of natural stimuli by distinct midbrain neuron subpopulations in weakly electric fish. Journal of neurophysiology, 106(6), 3102-3118.

Week 7 Presentations: Chapter 7

Antonsen, Brian L., and Donald H. Edwards. "Mechanisms of serotonergic facilitation of a command neuron." Journal of neurophysiology 98.6 (2007): 3494-3504.

Antonsen, Brian L., Jens Herberholz, and Donald H. Edwards. "The retrograde spread of synaptic potentials and recruitment of presynaptic inputs." The Journal of neuroscience 25.12 (2005): 3086-3094.

Week 9 Presentations: Chapter 8

Preuss, Thomas, and Donald S. Faber. "Central cellular mechanisms underlying temperature-dependent changes in the goldfish startle-escape behavior." The Journal of neuroscience 23.13 (2003): 5617-5626.

Medan, Violeta, and Thomas Preuss. "Dopaminergic-induced changes in Mauthner cell excitability disrupt prepulse inhibition in the startle circuit of goldfish." Journal of neurophysiology 106.6 (2011): 3195-3204.

Week 10 Presentations: Chapter 9

Müller-Ribeiro, Flávia CF, et al. "Disinhibition of the midbrain colliculi unmasks coordinated autonomic, respiratory, and somatomotor responses to auditory and visual stimuli." American Journal of Physiology-Regulatory, Integrative and Comparative Physiology 307.8 (2014): R1025-R1035.

Moreno-Paublete, R., Canlon, B., & Cederroth, C. R. (2017). Differential neural responses underlying the inhibition of the startle response by pre-pulses or gaps in mice. Frontiers in cellular neuroscience, 11, 19.

Week 11 Presentations: Chapter 10

Ben-Tov, Mor, et al. "Pop-out in visual search of moving targets in the archer fish." Nature communications 6 (2015).

Tsvilling, Vadim, et al. "Archer fish fast hunting maneuver may be guided by directionally selective retinal ganglion cells." European Journal of Neuroscience 35.3 (2012): 436-444.

Week 12 Presentations: Chapter 11

deVries, M.S. Murphy, E. A. K., and S. N. Patek. "Strike mechanics of an ambush predator: the spearing mantis shrimp." Journal of Experimental Biology 215.24 (2012): 4374-4384.

Burrows, Malcolm. "Neural control and coordination of jumping in froghopper insects." Journal of neurophysiology 97.1 (2007): 320-330.

Siwanowicz, I., & Burrows, M. (2017). Three dimensional reconstruction of energy stores for jumping in planthoppers and froghoppers from confocal laser scanning microscopy. Elife, 6, e23824.

Week 13 Presentations: Chapter 12

Feord, RC, Sumner, ME, Pusdekar, S, Kalra, L, Gonzalez, PT, Wardill, TJ. (2010). Cuttlefish use stereopsis to strike at prey. Science Advances (6)2: 6036

Otis, Thomas S., and W. F. Gilly. "Jet-propelled escape in the squid Loligo opalescens: concerted control by giant and non-giant motor axon pathways." Proceedings of the National Academy of Sciences 87.8 (1990): 2911-2915.

Tublitz, Nathan J., Michelle R. Gaston, and Poh Kheng Loi. "Neural regulation of a complex behavior: body patterning in cephalopod molluscs." Integrative and Comparative Biology 46.6 (2006): 880-889.

York, Carly A., Ian K. Bartol, and Paul S. Krueger. "Multiple sensory modalities used by squid in successful predator evasion throughout ontogeny." Journal of Experimental Biology 219.18 (2016): 2870-2879.

Mäthger, Lydia M., et al. "Disruptive coloration elicited on controlled natural substrates in cuttlefish, Sepia officinalis." Journal of Experimental Biology 210.15 (2007): 2657-2666.

NROS 430 Neurogenetics, Course Syllabus, Spring 2024
Tuesday & Thursday, 11 am – 12:15 pm
Haury Anthropology Bldg, Rm 129

Description
Neurogenetics deals with the molecular function of neural genes, their molecular signaling pathways and their relation to neurological disorders. It also provides a powerful methodology to examine molecular and cellular mechanisms of neuronal patterning, migration, connectivity, and all aspects of neuronal function including locomotion, perception, cognition, memory, and behavior.
This course teaches genetic approaches to study the nervous system and provides insights into the genetic nature and genetic models of neurological and psychiatric diseases. Part 1 of the course will provide a rigorous introduction to the basic concepts of contemporary Genetics and Genomics. Part 2 will discuss genetic approaches and technologies to study brain function in health and disease with an emphasis on genetic model organisms. Part 3 will discuss the inheritance, genetic cause, molecular & cellular pathogenesis and genetic animal models of neurological and psychiatric disorders like Spinal Muscular Atrophy, Autism Spectrum Disorders, Fragile X Syndrome, Rett Syndrome, Alzheimer disease, Parkinson disease, Huntington's Disease, Amyotrophic Lateral Sclerosis (ALS), Frontotemporal dementia (FTD), and emotional diseases like Schizophrenia & Bipolar Disorder.

Prerequisite(s)
MCB 181 (Molecular & Cellular Biology)
NROS 310 (Molecular and Cellular Biology of Neurons) or similar course

Instructors & Contact Information
Konrad E. Zinsmaier, Ph.D.
Professor
Department of Neuroscience and Molecular & Cellular Biology
office: Gould Simpson Bldg., Room 627
phone: 626-1343
email: kez4@arizona.edu

Preceptors
Bryce Alexander Wilson bryceawilson@arizona.edu
Sage Marie Crosby sagecrosby@arizona.edu
Stephen Taylor Walburn stwalburn@arizona.edu

Office Hours
Thursday, 3 pm, Gould-Simpson Room 601

otherwise: "Electronic Open-Door" policy. Contact any of us by email, and we will try to answer promptly, the latest with 24 hours.

Web Information
Course home page: D2l, https://d2l.arizona.edu/d2l/home/1125390
Instructor home page: https://neurosci.arizona.edu/person/konrad-zinsmaier-phd

Course Format
Lectures and occasional in-class discussion.

Class meetings
This class is scheduled to be taught exclusively in the in-person modality

- Meeting times and location:
  Tuesday, Thursday: 11:00 am – 12:15 pm (MST), Haury Anthropology Bldg, Rm 129

Course Objectives

- To provide you with a solid understanding of modern genetic principles.
- To familiarize you with the latest genetic technologies to manipulate genes and genomes.
- To introduce you to the genetics and animal models of "simple" and complex neurological, neurodegenerative, and neuropsychiatric diseases.

Expected Learning Outcome
By the end of the semester:

- You will be able to apply important concepts and principles of molecular genetics, classical genetics, and epigenetics.
- You will be able to design and apply modern genetic techniques to manipulate genomes for the study of the brain and other applications.
- You will be able to apply genetic concepts to animal models of simple and complex neurological, neurodegenerative, and psychiatric diseases/disorders.

Required Textbook and Other Readings
Unfortunately, there is no comprehensive textbook for this course available.

- Part 1 and 2 of the course can be supplemented by any Genetics textbook like:
  - "Principles of Genetics" (7ed) by D. Peter Snustad, Michael J. Simmons. Published by Wiley.
  - "Lewin's genes XII" by Jocelyn E. Krebs, Elliott S Goldstein, and Stephen T Kilpatrick. Published by Jones & Bartlett Learning.
  - Any other Genetics textbook may also be used for reference.
- Part 3 is based the current state of the scientific knowledge/literature. Accordingly, main readings for the course are:
  - assigned review & research papers

Additional reading and learning material will be made available on the D2L website of the course.

Assignment/Testing Schedule/Due Dates
Readings
Selected articles provided on D2L

Written assignments
None

Required extracurricular activities
None.

Exams
Students must take 3 exams (ea. 100 points). Exams are scheduled to be held in person. The format of the exam will be mostly short answer, multiple choice, and multi-select questions. The length of the exam is typically one hour.

There is no cumulative final exam.

Quizzes
Students need to complete at least 10 out of the 11 online quizzes (ea. 20 points). The 10 best quiz scores will be used to calculate the final grade. Accordingly, the maximal points derived from all quizzes will be 200.

Each quiz can be repeated once. The best score of a repeated quiz will be used to calculate the final grade. There is no time limit enforced.

Each quiz will become active on Thursday evening and remain open until Sunday 11 pm. Quizzes will include multiple choice and short answer questions covering the material discussed the same week.

The due dates for exams and quizzes are listed in the course schedule (D2L homepage) and the D2L calendar.

Grading Policy

On-line quizzes (20 points; 10 out of 11)	200 points
Exams (3, ea. 100 points)	300 points
Total	500 points

Grade Assignment

A	90-100%; B	80-89%; C	70-79%; D	60-69%; E	<60%.

Regrading Policy
If you believe that there has been an error in grading of an assignment, quiz or exam, please contact the instructor who will review the material in question. You must initiate a request for re-grading within 3 weeks of the date on which the grade was posted; otherwise, we will not consider the request.

Attendance Policy
Attendance is required for all sessions except:

- All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion.
- Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Make-up exams or quizzes require approval and will only be allowed in cases of well-documented emergencies. Make up exams or quizzes will be modified from the original.

Notify me (kez4@arizona.edu) if you will be missing an in-person session, or if you will miss an assignment deadline.

- Non-attendance for any reason does not guarantee an automatic extension of due date or rescheduling of examinations.
- Please communicate and coordinate any request directly with me (kez4@arizona.edu).

Classroom attendance

- If you feel sick, or if you need to isolate or quarantine based on University protocols, stay home. Except for seeking medical care, avoid contact with others and do not travel.
- Notify your instructor(s) if you will be missing a course meeting or an assignment deadline.
- Non-attendance for any reason does **not** guarantee an automatic extension of due date or rescheduling of examinations/assessments.
- Please communicate and coordinate any request directly with your instructor *(kez4@arizona.edu)*.
- If you must miss the equivalent of more than one week of class, please contact the Dean of Students Office DOS-deanofstudents@email.arizona.edu to share documentation about the challenges you are facing.
- Voluntary, free, and convenient COVID-19 testing is available for students on Main Campus.
- If you test positive for COVID-19 and you are participating in on-campus activities, you must report your results to Campus Health. To learn more about the process for reporting a positive test, visit the Case Notification Protocol.
- The COVID-19 vaccine and booster is available for all students at Campus Health.
- Visit the UArizona COVID-19 page for the most up-to-date information

Compliance with COVID-19 mitigation guidelines
As we enter the Spring semester, the health and wellbeing of everyone in this class is the highest priority. Accordingly, we are all required to follow the university guidelines on COVID-19 mitigation. Please visit www.covid19.arizona.edu for the latest guidance.

Equipment and software requirements
For this class you will need access to the following hardware: computer or web-enabled device; regular access to reliable internet signal; ability to download and run the following software: Adobe Acrobat, Word.

Academic advising. If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

Student Code of Academic Integrity
Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, students are expected to adhere to the UA *Code of Academic Integrity.* Graded work (exams and quizzes) must be the product of independent effort unless otherwise instructed. The policies related to issues like cheating and plagiarism will be strictly enforced. Read the full Code at https://deanofstudents.arizona.edu/student-rights-responsibilities/academic-integrity

Classroom Behavior and Classroom Policies Regarding Effective Learning
Individuals in groups can learn best when all are considerate of each other. Therefore, we ask that you please

make every effort to make the environment in the classroom conducive to effective learning. This includes such things as turning off your cell phone, only using your laptop for class related activities, refraining from conversation that is not geared toward the topic of the day, arriving on time, and leaving when class is finished. Read the full *Student Code of Conduct* at http://deanofstudents.arizona.edu/studentcodeofconduct

Principle (from the above website). Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. This principle is furthered by the student Code of Conduct and disciplinary procedures established by ABOR Policies 5-308 - 5-403, all provisions of which apply to all University of Arizona students. This Code of Academic Integrity (hereinafter "the Code") is intended to fulfill the requirement imposed by ABOR Policy 5-403.A.4 and otherwise to supplement the student Code of Conduct as permitted by ABOR Policy 5-308.C.1. When you sign your name to your work, you are signing that it is solely your work.

UA Nondiscrimination and Anti-harassment Policy
The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy. Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Policy against Threatening behavior
The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self.

University of Arizona policies apply and can be found in the following website:
http://policy.web.arizona.edu/~policy/threaten.shtml.

Notification of Objectionable Materials
This course may contain material that may be deemed offensive by some students. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Accessibility and Accommodations
At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, drc.arizona.edu) to establish reasonable accommodations.

Gender Pronoun
It is already UA policy that class rosters are provided to instructors with a student's preferred name. Students may share their preferred name and pronoun with members of the teaching staff and fellow students, as desired, and these gender identities and gender expressions will be honored in this course. As the course includes group work and in-class discussion, it is critical to create an educational environment of inclusion and mutual respect. In this class, to be inclusive of all gender identities and expressions, students will be referred to by their first or last names, the pronoun of their choice, or by default, the pronoun "they".

Confidentiality of Student Records
See http://www.registrar.arizona.edu/ferpa/default.htm

Life challenges
If you are experiencing unexpected barriers to your success in the courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges
If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

The information in this course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor. Any changes to the syllabus will be announced in class and posted on the D2L website

Schedule

as of January 8, 2023

Jan 12 (*Lecture 1*)	Course Overview & Introduction
Jan 17 (*Lecture 2*)	Evolving Concept of a Gene
Jan 19 (*Lecture 3*)	Genomes, Gene Regulation and Genetic Networks
Quiz 1	
Jan 24 (*Lecture 4*)	Genetic Variation and Concept of Mutations
Jan 26 (*Lecture 5*)	Genetic Variations causing Mutations
Quiz 2	
Jan 31 (*Lecture 6*)	Epigenetics and Gene Expression
Feb 2 (*Lecture 7*)	Mendel & Sex Linkage
Quiz 3	
Feb 7 (*Lecture 8*)	Gene Linkage & Gene Mapping
Feb 9 (*Lecture 9*)	Genetic Classification of Mutant Alleles
Quiz 4	
Feb 14	**Exam 1** (lectures 2-9)
Feb 16 (*Lecture 10*)	Genetic Mosaics, Genetic buffers, and Suppressor Mutations
Feb 21 (*Lecture 11*)	Modeling Disease and Gene Knockdown
Feb 23 (*Lecture 12*)	Gene Knockout by Homologous Recombination
Quiz 5	
Feb 28 (*Lecture 13*)	Conditional Gene Knockout by Site-Specific Recombination
Mar 2 (*Lecture 14*)	CRISPR/Cas9-mediated Gene Editing
Quiz 6	
	Spring Break (March 4 – 12)
Mar 14 (*Lecture 15*)	Optogenetics
Mar 16 (*Lecture 16*)	Complex Diseases and Genome-wide Association Studies (GWASs)
Quiz 7	
Mar 21 (*Lecture 17*)	Motor Neuron Diseases, SMA
Mar 23 (*Lecture 18*)	Amyotrophic Lateral Sclerosis (ALS) & Frontotemporal Dementia (FTD)
Quiz 8	
Mar 28	**Exam 2** (lectures 10-18)
Mar 30 (*Lecture 19*)	Intellectual Disabilities: Fragile X Syndrome
Apr 4 (*Lecture 20*)	Behavioral Disorders: Autism Spectrum Disorders
Apr 6 (*Lecture 21*)	Rett Syndrome
Quiz 9	
Apr 11 (*Lecture 22*)	Discussion
Apr 13 (*Lecture 23*)	Tandem Repeat Genetics - Huntington's Disease
Quiz 10	
Apr 18 (*Lecture 24*)	Alzheimer's Disease
Apr 20 (*Lecture 25*)	Parkinson's Disease
Quiz 11	
Apr 25 (*Lecture 26*)	Schizophrenia, Bipolar Disorder & Depression

Apr 27 (*Lecture 27*) Discussion
Quiz 12

May 2 **Exam 3** (lectures 18-27)

The course schedule and syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor. Any changes will be announced in class and posted on the D2L website

Additional Crisis Information

Located in Tucson? Call the Community-Wide Crisis Line 24 hours a day, 7 days a week at 520-622-6000.

Are you a University of Arizona student? If it is not an emergency and you are a UA student, call or walk-in to Counseling and Psych Services at 520-621-3334 Monday - Friday. Walk-in triage is available between 9 am and 4 pm Monday - Friday.

Are you a concerned friend? Concerned friends can find out more about helping a friend who might be experiencing problems through our Friend 2 Friend website.
Resources for sexual assault, relationship violence, and stalking.

24-Hour Hotlines
The National Suicide Prevention Lifeline is a 24-hour, toll-free, confidential suicide prevention hotline available to anyone in suicidal crisis or emotional distress. By dialing 1-800-273-TALK (8255), the call is routed to the nearest crisis center in our national network of more than 150 crisis centers. The Lifeline's national network of local crisis centers provides crisis counseling and mental health referrals day and night.

Crisis Text Line: Text HOME to 741741 from anywhere **in the United States**, anytime, about any type of crisis. A live, trained Crisis Counselor receives the text and responds, all from a secure online platform. Find out more about how it works at crisistextline.org.

Suicide Prevention for LGBTQ Youth through the Trevor Project:

- **The Trevor Lifeline** is a 24/7 suicide hotline: 866-4-U-TREVOR (1-866-488-7386)
- TrevorChat**:** Online instant messaging available 7 days a week, 3 pm - 10 pm ET (12 pm -- 7 pm PT)
- **TrevorText:** Confidential and secure resource that provides live help for LGBTQ youth with a trained specialist, over text messages. Text TREVOR to 1-202-304-1200 (available 7 days a week, 3 pm - 10 pm ET, 12 pm 7 pm PT)

Veterans' Suicide Prevention Lifeline: 1-800-273-TALK (1-800-273-8255)

SAMHSA Treatment Referral Hotline (Substance Abuse): 1-800-662-HELP (1-800-662-4357)

National Sexual Assault Hotline: 1-800-656-HOPE (1-800-656-4673)

Loveisrespect (National Dating Abuse Helpline): Call 1-866-331-9474 (TTY: 1-866-331-8453). Text LOVEIS to 22522 - you'll receive a response from a peer advocate prompting you for your question. Go ahead and text your comment or question and we will reply.

NROS 435: Complex Behavioral, Cognitive and Emotional Disorders

Location and Times: TBD

Description of Course

This course will help students explore the neural mechanisms of complex behaviors such as motivation, cognition, and emotions, and how malfunction of the neural circuits leads to related diseases such as eating disorders, dementia, and depression. The course will require students to study primary literature in depth to understand not only the mechanism of these behaviors and disorders, but also the diverse methodologies employed in these studies. This course will equip students with analytical tools by emphasizing critical thinking and presentations skills.

Credit. 3 units.

Course Prerequisites or Co-requisites

Pre-requisite courses: NROS 318

Instructor and Contact Information

Haijiang Cai, Ph.D., Associate Professor, Department of Neuroscience
haijiangcai@arizona.edu
Telephone: 520-621-6654
Instructor home page: https://neurosci.arizona.edu/person/haijiang-cai-phd
Office: Gould-Simpson 427
Office hours: by appointment

TBD, Teaching assistant
@arizona.edu
Office hours: by appointment

Course website: see D2L website (https://d2l.arizona.edu)
The D2L website will include announcements, assignments, grades, links to required and background reading materials, and slides for all class sessions. Students should check the website regularly.

Course Format and Teaching Methods

Lectures and presentations, small-group activities or group projects, in-class discussion led by the instructor and the students, web-delivered content, or assessment, etc.

Course Objectives

The course aim to let student learn how to identify important research questions related to complex behavioral, cognitive and emotional disorders; analyze and evaluate the neural mechanisms; critically assess current research findings and methodologies employed in the study; synthesize information from primary literature to deepen understanding of the etiology, progression, and treatment modalities for various disorders; develop the ability to communicate complex concepts effectively through written analysis and oral presentations; explore emerging trends and controversies in the field, encouraging active engagement with ongoing debates and advancements.

Expected Learning Outcomes

By the end of the course, you should be able to:

1. Understand and describe the basic neural mechanisms underlying a range of complex behaviors and related diseases, such motivation behavior and eating disorders, cognitive behaviors and dementia, emotional behaviors and depression, social interaction behaviors and autism.
2. Identify and analyze the diverse symptomatology associated with each disorder, recognizing both shared and distinct manifestations.
3. Critically evaluate and synthesize information from primary literature to elucidate the etiology, progression, and treatment options for complex behavioral, cognitive, and emotional disorders.
4. Apply knowledge of current research methodologies to assess the validity and reliability of studies investigating these disorders.
5. Communicate effectively through written analyses and oral presentations, articulating complex concepts related to the neurobiology and clinical manifestations of various disorders.

Makeup Policy for Students Who Register Late

Students who register after the first class meeting may make up missed assignments/quizzes with an adjusted deadline approved by the instructor.

Course Communications

The students should communicate with the instructor through UA e-mail or D2L.

Required Texts or Readings

The primary literature and reference articles will be distributed on D2L.

No required textbooks, but we recommend these textbooks for reference.

1. Kandel, ER. *et al*. (2021) *Principles of Neural Science* 6th edition. New York: McGraw Hill Medical. ISBN 9781259642234.
2. Bear, MF. *et al*. (2016) *Neuroscience: Exploring the Brain, 4th Edition*. Philadelphia: Wolters Kluwer. 978-2-36110-080-3.
3. Luo, L (2020) Principles of Neurobiology. New York: Garland Science. ISBN 9780367514716 (hbk), 9780815346050 (pbk) 9781003053972 (ebk).

Required or Special Materials

None.

Required Extracurricular Activities

Not applicable.

Assignments and Examinations: Schedule/Due Dates

We will discuss 10-12 complex behavioral, cognitive and emotional disorders such as anxiety, depression, autism, schizophrenia, bipolar disorder, borderline personality disorder, eating disorders, etc. Each topic will be covered by 1-3 original research articles. The students are required to write a report on 10 topics. The report will cover the background of the research, major questions of the study is addressing, major methodologies employed, major results and interpretation, and the knowledge obtained from the study, as well as comments on the strengths and weaknesses of the study. Each student is required to give at least one presentation during the class.

Report: 20 points each, total 200 points

Presentations: 50 points.

Class discussion: 50 points.

See class schedule for the due dates of the reports and presentations.

***Extra credit*.** You may earn up to **20 points** by submitting an extra report about a topic discussed in the class.

Final Examination or Project

TBD or please see the class schedule. Final exam schedule can be found at: https://registrar.arizona.edu/finals

Grading Scale and Policies

Total possible points:
A = 90-100%
B = 80-89%
C = 70-79%
D = 60-69%
E = 0-59%

Assignment	*Points*	*~% of Final Grade*
Reports: (20 points each)	200	50%
Presentations: (50 points)	50	12.5%
Class discussion: (50 points)	50	12.5%
Final exam (100 points)	100	25%
Total	**400**	**100%**
Extra credits	Up to 20 points	~5%

Late assignments
Assignments turned in 1 day later 75%, 2 days later 50%, > 2 days 0%. Without permission given before the posted deadline, assignments will not be accepted later than 2 days.

Re-grading policy

If you believe that there has been an error in grading of an assignment, quiz or exam, please contact the TA who will review the material in question. The instructors will be a second level of access if the TA is not able to resolve the concern. *You must initiate a request for re-grading within 1 week of the date on which the grade was posted*, otherwise we will not consider the request.

Specify the grade distribution for the course. University policy regarding grades and grading systems is available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system.

Provide a detailed explanation of the methods of evaluation and how the final grade will be calculated, including components/assignments, weightings, evaluation criteria, explanation of how late work will be graded, and description of extra-credit opportunities.

Incomplete (I) or Withdrawal (W):

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policy, which is available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system.

Dispute of Grade Policy

If you believe that there has been an error in grading of an assignment, quiz or exam, please contact the TA who will review the material in question. The instructors will be a second level of access if the TA is not able to resolve the concern. *You must initiate a request for re-grading within 1 week of the date on which the grade was posted*, otherwise we will not consider the request.

Honors Credit

Students wishing to contract this course for Honors Credit should email me to set up an appointment to discuss the terms of the contract. Information on Honors Contracts can be found at https://www.honors.arizona.edu/honors-contracts.

Scheduled Topics/Activities

The schedule may be updated every semester.

Class time	Report due date (TBD)	Topics/Activities
1		Introduction
2-4		Motivation behaviors
5-7		Eating disorders (anorexia Nervosa, bulimia Nervosa, binge eating disorder)
8-10		Emotional behaviors
11-13		Anxiety disorders, depression, bipolar disorder, and post-traumatic stress disorder (PTSD)
14-16		Circadian rhythm
17-19		Sleep disorders, sleep apnea, insomnia, narcolepsy
20-22		Social interaction behaviors
23-25		Autism spectrum disorders, social anxiety disorder
26-28		Cognitive behaviors
29-31		Alzheimer's disease, dementia
32-34		Substance use behaviors
35-37		Alcohol use disorder, substance dependence, addiction
38-40		Sexual and aggression behaviors
41-43		Honors contract and final exam

Bibliography

All bibliography materials will be posted on D2L.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Additional recommendations depending on instructor preferences:

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Alternate language for those who want to restrict computers and laptops to an area of the classroom:

Some learning styles are best served by using personal electronics, such as laptops and iPads. These devices can be distracting to other learners. Therefore, students who prefer to use electronic devices for note-taking during lecture should use one side of the classroom.

Alternate recommended language for those who do not wish to permit laptops in the classroom:

The use of personal electronics such as laptops, iPads, and other such mobile devices is distracting to the other students and the instructor. Their use can degrade the learning environment. Therefore, students are not permitted to use these devices during the class period.

Notification of Objectionable Materials

This course will contain material of a mature nature, which may include explicit language, depictions of nudity, sexual situations, and/or violence. The instructor will provide advance notice when such materials

will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Safety on Campus and in the Classroom

For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview

Also watch the video available at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy0000000000003560

Additional Resources for Students

UA Academic policies and procedures are available at http://catalog.arizona.edu/policies

Campus Health
http://www.health.arizona.edu/
Campus Health provides quality medical and mental health care services through virtual and in-person care.
Phone: 520-621-9202

Counseling and Psych Services (CAPS)
https://health.arizona.edu/counseling-psych-services
CAPS provides mental health care, including short-term counseling services.
Phone: 520-621-3334

The Dean of Students Office's Student Assistance Program
https://deanofstudents.arizona.edu/support/student-assistance
Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services.
Email: DOS-deanofstudents@arizona.edu
Phone: 520-621-7057

Survivor Advocacy Program
https://survivoradvocacy.arizona.edu/
The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.
Email: survivoradvocacy@arizona.edu
Phone: 520-621-5767

Confidentiality of Student Records

http://www.registrar.arizona.edu/ferpa

University-wide Policies link

Links to the following UA policies are provided here, http://catalog.arizona.edu/syllabus-policies:

- Absence and Class Participation Policies
- Threatening Behavior Policy

- Accessibility and Accommodations Policy
- Code of Academic Integrity
- Nondiscrimination and Anti-Harassment Policy
- Subject to Change Statement

NROS 440: How to Build a Brain:
Mechanisms of Neural Development
Course Syllabus
Spring 2024, MWF 11:00-11:50am
Social Sciences, Room 118
Marina Cholanian, Ph.D.

Course description
3 credit hours, Spring semester

This course will allow students to explore and analyze our current knowledge of how neurons are born, organized into circuits, shaped by activity, and regenerated after injury. Students will connect the mechanisms of nervous system development with diseases affecting the process. Finally, students will practice and then present critical analysis of published data in the field of developmental neuroscience.

Lectures: Held on MWF at 11:00 – 11:50 am in Social Sciences, Room 118. "Lectures" are in fact a mix of presentation of content, group work, and problem-solving sessions. Attendance during the lecture is highly recommended for your understanding of the material and gives you the opportunity to ask questions.
Paper Discussions and Experimental Design sessions are group sessions. Your attendance is required, and absences may be reflected in your peer evaluation scores. These will be conducted almost entirely in groups.

Course prerequisites
NSCS 200 and NROS 310 (or a similar course) are required.

Instructor
Marina Cholanian, Ph.D.
Assistant Professor of Practice,
Department of Neuroscience
Office: Gould-Simpson Building - Room 642
Email: shetka@arizona.edu (will reply within 24 hours M-F)
Office hours: Mondays at 12:30pm or email for an appointment.
Pronouns: She/Her/Hers

Preceptors:
Fatima Ahmed Al Jaberi: faljaberi@arizona.edu
Natalie Pavlick: npavlick@arizona.edu
Joseph Fraire: josephufraire@arizona.edu

Course website
See D2L website at: https://d2l.arizona.edu
The website will include announcements, assignments, grades, links to required and background reading materials, and slides for all class sessions. Students should check the website regularly.

Course Objectives:
During this course, students will:

- Integrate reading, primary literature, and classroom discussion to
    - Identify and explain mechanisms that determine neuronal cell fate, final location, guidance of projections, and integration into circuits.
    - Explain how synapses are formed, strengthened, and eliminated.
    - Describe the contributions of adult neurogenesis and axon regeneration to continued function of the nervous system.
    - Draw mechanistic connections between essential processes in development and the occurrence of diseases of the nervous system.
- Read primary literature and critically evaluate evidence supporting our current state of knowledge in neural development.
- Facilitate in-class discussion of a primary article pertaining to neural development.
- Hone their writing, speaking, and analysis skills in the pursuit of mastery of course material.

Expected Learning Outcomes:
At the end of this course you will be able to:

1. Describe the factors controlling the birth, proliferation, differentiation, and integration of neurons into the central and peripheral nervous systems (NSCS Program Outcome A9, NS12)
2. Explain the origins of psychiatric and developmental disorders affecting neuronal function, and apply knowledge of development to predict likely disorders from disruption of genetic or cellular pathways (NSCS Program Outcome A10, NS17)
3. Apply knowledge of common experimental techniques in developmental neurobiology to form conclusions from data in primary literature, evaluate the strengths and weaknesses of data, and design experiments to address current gaps in our knowledge of neurodevelopment (NSCS Program Outcome A11, B1-B6)

Required Texts or Readings
There are no required textbooks. However, most lecture material will come from the optional textbook:
Development of the Nervous System, 3rd or 4th Edition (Sanes, Reh, Harris). I will be using the 4th edition. Readings from this book will be extremely helpful to understand primary literature and participate fully in discussion.

Course Communications and Instructor Availability
All course communication will be done through D2L or by email. Please check your email regularly for updates. The instructor will strive to respond to all emails within **24 hours of receipt Monday-Friday. Immediate replies should not be expected and there will be no replies over the weekend.**

Schedule of Class Activities: Please see the schedule (separate document).

Other Required or Special Materials: You will need to have a computer with reliable internet access.

Required Assignments and Examinations: Schedule/Due Dates
This course will have 5 quizzes (lowest will be dropped), 3 group work assignments, 3 experimental design problem sets, and a final report. The expected schedule of class meetings, assignments and assessments, and their due dates is attached to the syllabus.

- The quizzes will take place during the first 10 minutes of the class as per class schedule.
- The experimental design problem sets as well as group discussion assessments will be mostly completed in class but will be due to be submitted via D2L (Assignments tab) following the in-class work. These are group assignments and will be graded one per group.
- A peer evaluation is required at the conclusion of group activities to ensure contributions by all group members. This is due on the final day of class (5/1) but can be done earlier.
- The final report will be due by 11am (class time) on Friday, April 26th. This is an individual assignment.

Grading policy

Regular grades are awarded for this course:
90-100% A
80-89% B
70-79% C
60-69% D
0-59% E

Grades of Incomplete ("I") will be awarded only at the end of the semester and **not on account** of disappointing performance. Students who are doing poorly in the course should drop it or withdraw (taking a grade of "W") before the UA deadlines for those actions. Requesting "W" grade after the deadline will require a petition to the Dean for an approval.

Quizzes: Quizzes will be given promptly at the beginning of class on dates indicated in the course schedule (5 quizzes total, lowest quiz will be dropped), and will be designed to test and consolidate students' understanding of any material covered since the previous quiz, but any previously presented material is a fair game. The quizzes will involve quantitative problem solving as well as analysis and explanation of phenomena in clear, coherent, written English. **No make-up quizzes will be offered**. If you miss a quiz for any reason, whether excused or unexcused, that quiz will be your dropped one.

Late Policy: No late assignments will be accepted.

Attendance Policies:
Attendance is not a graded criteria in this course. However, peer evaluation of your contributions to group assignments (done during class) IS a graded criteria. Notify your instructor if you will be missing a course meeting or an assignment deadline. Non-attendance for any reason does not guarantee an automatic extension of due date. Please communicate and coordinate any request directly with your instructor. If you must miss the equivalent of more than one week of class, you should contact the Dean of Students Office (DOS-deanofstudents@email.arizona.edu) to share documentation about the challenges you are facing. DOS documentation may be required if substantial disruption to class participation occurs.

Extra Credit Opportunities: There will be opportunities for an extra credit, but those will only be announced in class and you cannot submit them if you are not attending.

The grade breakdown is as follows:

	Point breakdown
Quizzes (best 4 of 5 will be counted @ 10 pts each)	40
Discussion Group Assessments (5 @ 12 pts each)	60
Experimental Design Problem sets (3 @ 30 pts each)	90
Peer Evaluation of Group Work	10
Final paper	100
TOTAL POINTS	300

Subject to Change Statement
Information contained in the course syllabus and schedule, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor. Any changes to the syllabus or schedule will be announced in class and posted on the D2L website.

Dispute of Grade Policy
The instructor will make every attempt to grade assignments fairly and accurately, and within a reasonable time frame. If you believe that there has been an error in grading of an assignment, please contact Dr. Cholanian. You must initiate a request for re-grading within 1 week of the date on which the assignment was returned/graded, otherwise I will not consider the request.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

Digital Etiquette and Electronics Policy
Use of laptops in class is a controversial issue in education. While good uses of them exist, it is

widely acknowledged that they can be distracting to peers if misused. Furthermore, it is also well known that taking written notes and making drawings increases learning of material. For these reasons, **laptops will not be permitted to be used during "lecture" sessions, except in the case of a documented disability requiring their use.** Tablets or laptops in flattened positions for stylus note-taking are permitted. Please bring notepaper and a pen for note-taking. **Laptops WILL be permitted on the paper group work days and on the 3 experimental design group work days**; these days are listed on the calendar.

Phones are never permitted to be used in class and must be put away (i.e. not on the desktop). If students are observed to be using electronic devices in ways not related to class materials, they may be confiscated by the instructor and returned after class. If you are expecting a critical phone call, please let Dr. Cholanian know before class begins.

Further UA policies

The UA's policy concerning mask wearing guidance can be found here:
https://covid19.arizona.edu/

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop. The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy. Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/absences . Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Classroom behavior and classroom policies regarding effective learning
Students are expected to adhere to the UA Student Code of Academic Integrity. Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. Graded work/exercises, however, must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity. .

Individuals in groups learn best when all are considerate of each other. Therefore, you are asked to make every effort to make the classroom environment conducive to learning. Please turn off your cell phone, use your laptop computer only for class-related activities, and refrain from conversation that is not focused on the topic of the day. Please also arrive in class on time and do

not leave until class is finished. Read the full UA Student Code of Conduct at: http://dos.web.arizona.edu/uapolicies/scc5308abcd. The Student Code of Conduct prohibits threats of physical harm to any member of the University community, including to one's self. See: http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, https://drc.arizona.edu) to establish reasonable accommodations.

If you have accommodation requests, please plan to meet with Dr. Cholanian by appointment to discuss the accommodations and how course requirements and activities may impact your ability to fully participate.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity. The University Libraries have some excellent tips for avoiding plagiarism, available at http://www.library.arizona.edu/help/tutorials/plagiarism/index.html.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at http://catalog.arizona.edu/2015-16/policies/aaindex.html. Student Assistance and Advocacy information is available at http://deanofstudents.arizona.edu/student-assistance/students/student-assistance.

Subject-to-change statement Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor. Any changes to the syllabus will be announced in class and posted on the D2L website.

Faculty ownership rights in lecture notes and course materials
Course instructors hold the copyright to their lectures, lecture slides, quizzes and exams, and other original course materials. This copyright includes student notes or summaries that substantially reflect the instructors' lectures or materials. These materials are made available only for personal use by students, and *students may not distribute or reproduce the materials for commercial purposes without the instructors' express written consent*. (This does not prevent students from sharing notes on an individual basis for personal use.) Violation of an instructor's copyright may result in course sanctions and violate the Code of Academic Integrity.

Academic advising. If you have questions about your academic progress this semester, or your chosen degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed.

Policy against Threatening behavior
The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self.

University of Arizona policies apply and can be found in the following website: http://policy.web.arizona.edu/~policy/threaten.shtml.

Notification of Objectionable Materials
This course may contain material that may be deemed offensive by some students. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Gender Pronoun
It is already UA policy that class rosters are provided to instructors with a student's preferred name. Students may share their preferred name and pronoun with members of the teaching staff and fellow students, as desired, and these gender identities and gender expressions will be honored in this course. As the course includes group work and in-class discussion, it is critical to create an educational environment of inclusion and mutual respect. In this class, to be inclusive of all gender identities and expressions, students will be referred to by their first or last names, the pronoun of their choice, or by default, the pronoun "they".

Confidentiality of Student Records
See http://www.registrar.arizona.edu/ferpa/default.htm

Life challenges
If you are experiencing unexpected barriers to your success in the courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

Physical and mental-health challenges
If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Additional Crisis Information

Located in Tucson? Call the Community-Wide Crisis Line 24 hours a day, 7 days a week at 520-622-6000.

Are you a University of Arizona student? If it is not an emergency and you are a UA student, call or walk-in to Counseling and Psych Services at 520-621-3334 Monday - Friday. Walk-in triage is available between 9 am and 4 pm Monday - Friday.

Are you a concerned friend? Concerned friends can find out more about helping a friend who might be experiencing problems through our Friend 2 Friend website.
Resources for sexual assault, relationship violence, and stalking.

24-Hour Hotlines
The National Suicide Prevention Lifeline is a 24-hour, toll-free, confidential suicide prevention hotline available to anyone in suicidal crisis or emotional distress. By dialing 1-800-273-TALK (8255), the call is routed to the nearest crisis center in our national network of more than 150 crisis centers. The Lifeline's national network of local crisis centers provides crisis counseling and mental health referrals day and night.
Crisis Text Line: Text HOME to 741741 from anywhere **in the United States**, anytime, about any type of crisis. A live, trained Crisis Counselor receives the text and responds, all from a secure online platform. Find out more about how it works at crisistextline.org.
Suicide Prevention for LGBTQ Youth through the Trevor Project:

- **The Trevor Lifeline** is a 24/7 suicide hotline: 866-4-U-TREVOR (1-866-488-7386)
- TrevorChat**:** Online instant messaging available 7 days a week, 3 pm - 10 pm ET (12 pm -- 7 pm PT)
- **TrevorText:** Confidential and secure resource that provides live help for LGBTQ youth with a trained specialist, over text messages. Text TREVOR to 1-202-304-1200 (available 7 days a week, 3 pm - 10 pm ET, 12 pm -- 7 pm PT)

Veterans' Suicide Prevention Lifeline: 1-800-273-TALK (1-800-273-8255)
SAMHSA Treatment Referral Hotline (Substance Abuse): 1-800-662-HELP (1-800-662-4357)
National Sexual Assault Hotline: 1-800-656-HOPE (1-800-656-4673)
Loveisrespect (National Dating Abuse Helpline): Call 1-866-331-9474 (TTY: 1-866-331-8453). Text LOVEIS to 22522 - you'll receive a response from a peer advocate prompting you for your question. Go ahead and text your comment or question and we will reply.

NEW COURSE

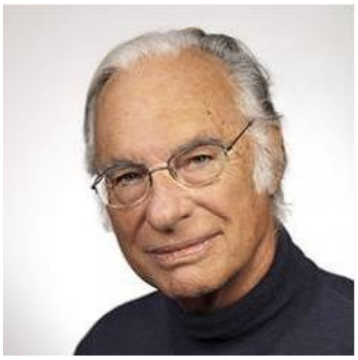
201 Level

Title: "Rationality and Cognition"

Syllabus

Instructor

Massimo Piattelli-Palmarini
Professor of Cognitive Science, Linguistics and Psychology



massimo@email.arizona.edu

Required Texts and Readings

Required: Daniel Kahneman "Thinking Fast and Slow"

Recommended, but optional: Massimo Piattelli-Palmarini "Inevitable Illusions"

Plus: readings and class handouts in D2L (See Course Schedule)

The Course

This course will offer a critical comparison of fully rational, normative principles of decision making and real-life decision processes in a majority of ordinary subjects. It will start with a presentation of the axioms and theorems of mathematical probability theory, followed by a presentation of the most common probabilistic fallacies (mostly derived from Prospect Theory – Tversky and Kahneman being the main classic authors). We will see the framing of decisions, packing/unpacking of choices, anchoring, ease of representation, the conjunction fallacy, the disjunction fallacy, the neglect of base rates and the causal fallacy. The most characteristic examples will be offered to the class and responses will be collected anonymously via clickers (or similar). Lessons from the class responses will be derived.

We will then move onto Subjective Expected Utility (SEU). The axioms will be presented and discussed. After this, the classic examples of violations of the axioms (The Allais Paradox, the Ellsberg Paradox

and more) will be presented to the class and responses will be collected anonymously via clickers (or similar). Lessons from the class responses will be derived.

Finally, elements of game theory and the core notion of Nash Equilibria will be presented, followed by classic examples of non-conformity in the majority of naïve subjects.

Whenever the existing scientific literature on each of these topics will turn out to be too difficult for a 200 level course, the instructor will write simplified handouts explaining the basics in as simple a way as possible without loss of rigor.

Course Objectives

Objective 1: gain a solid understanding of the foundations of rational decision making.

Objective 2: identify decision traps and how to avoid being trapped.

Objective 3: identify how the brain implements decision making.

Objective 4: reflect about the evolution of cognition, the way humans and animals problem solve and communicate with one another.

Expected Learning Outcomes

Outcome 1: Understand the difference between normative models of rational decision making (probability, game theory, maximization of subjective expected utility) and real-life data on how decisions are actually made.

Outcome 2: Learn to detect and correct decision biases and unconscious distortions of how available alternatives are perceived and selected/discarded.

Outcome 3: Gain an understanding of some pathologies in decision making, of their manifestations and of the underlying brain deficits.

Outcome 4: Understand a broad picture of the evolution of the brain, of cognition and of how some components of intelligence are common with non-human primates, while other components are unique to humans.

Classroom Format:

This is a 100% online and asynchronous course, meaning that there will be no regularly scheduled meeting times. Students will follow a course calendar, outlining all of the scheduled activities and assignments students should complete each week throughout the semester. The D2L course management system will be used to conduct the course. I will provide regular reminders through email and announcements on the D2L course site, but it is ultimately the responsibility of the student to progress through the course and complete all assignments by the required deadlines. **To participate in this fully online course, students must have daily, reliable access to D2L.**

The grade

4 Weekly quizzes (See Course Schedule): 30% of the final grade.

Each quiz consists of 10 multiple choice questions (only one answer is the right answer), on what we have seen in class that week and the readings for that week. Each question is worth 1/10th of the grade for the quiz as a whole.

Once opened, each quiz must be completed within 30 minutes.

There is ample time if the student has watched the lectures, has studied the slides projected (available in D2L right after each lecture), and has read the assigned reading(s) for that week. There is not enough time to "go back" to the slides and the readings to select the right answer to the questions.

There are 4 weekly quizzes in total. A student is allowed to miss up to one weekly quiz without any penalty. For those students who will have taken all the weekly quizzes, the lowest grade (if any) will be neglected in the calculation of the grade for the quizzes. Late quizzes and re-takes will not be allowed.

Class Discussions (10% of grade)

Throughout the course there will be **5** discussion prompts posted. Discussions can be accessed by clicking the "Discussion" tab in the top banner in D2L.

Each discussion prompt will be unique to the content being covered that week. Detailed directions will be provided with each prompt, but in general, you will be asked to: read the prompt, comment, and reply to a classmate. Your posts should reflect critical thought and should demonstrate connection to course content. Be sure to read the instructions carefully and leave time to ask questions and allow other students time to respond to your post.

No late discussion posts will be accepted for any reason. Please reference the course schedule for due dates, and plan your schedule accordingly.

Mid-term Examination: 30% of the final grade.

Twenty multiple choice questions on all we will have seen in class until then.
Time to complete: 60 minutes.

Final Examination (non-cumulative): 30% of the final grade.

20 multiple choice questions + one long answer question, individually chosen among three questions suggested. Maximum one page (500 words), 2/3ds of a page is also OK. Time to complete each: one hour, for a total of 2 hours.

Late exams (both midterm and final) and retakes will not be allowed.

Links to the Final Exam Regulations, https://www.registrar.arizona.edu/courses/final-examination-regulations-and-information, and Final Exam Schedule, http://www.registrar.arizona.edu/schedules/finals.htm

Letter Grade Distribution

A = 90-100%
B = 80-89.9%
C = 70-79.9%
D = 60-69.6%
E = Below 60%

Late Assignments

Late work will not be accepted in this course. Quizzes, exams, and discussions will close at the specified time on the listed due date, so late submissions will not be possible. Please plan your schedule accordingly.

Grade Appeals

If you would like to appeal a grade for an assignment, you should do so within 7 days from the day the grade was returned to you. Any appeal that does not come within 7 days will not be considered. If you make an appeal, you should state either (a) why you believe your assignment was incorrectly scored, or (b) why you believe your answer to a particular question or item is correct.

Course Policies:

Classroom behavior policy: This is a fully remote, 100% online course, which includes communication with instructors and peers through email, discussion forums, and web conferencing. Students are expected to act in a respectful and professional manner. The presentation of differing views and perspectives as they relate to course content is encouraged but must be done in a respectful manner. Any disparagement of others' views is unacceptable. All written communication should be checked for spelling and grammar. See the following for more information: https://deanofstudents.arizona.edu/disruptive-behavior

Threatening behavior:

The University seeks to promote a safe environment where students and employees may participate in the educational process without compromising their health, safety or welfare. The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self. Threatening behavior can harm and disrupt the University, its community and its families. Please see the following document for more information:
http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students

Academic Integrity: The University student code of Academic Integrity prohibits plagiarism in any and all class assignments and activities in this course. Please see the following document for more information: https://deanofstudents.arizona.edu/policies/code-academic-integrity

Nondiscrimination and Anti-Harassment policy: Our online classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others. The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Absence and Class Participation Policy: Because this is an online course, absence and class participation will be assessed through the completion of required course assignments. Participation in the course is assessed through the completion of the discussions, where you will interact with your classmates in discussion of course material.

Accessibility and Accommodations:

It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know

immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268, email: uadrc@email.arizona.edu , http://drc.arizona.edu/) to establish reasonable accommodations.

Subject to Change Statement:
Information contained in the course syllabus, other than the grade policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor. If any changes are made, they will be provided immediately in writing to students via posting to the D2L course website.

Incomplete Grade Policy:
Incomplete grades will be given only in special circumstances as outlined in university policy as stated in "The University of Arizona Record General Academic Manual."

Student Responsibility for Managing Their Course Progression: Although the instructor tries to help guide each student through the course, it is ultimately the responsibility of the student to direct their course progress, including following the course schedule, minding due dates, keeping up with required readings, and participating in all class components. All due dates are listed in the syllabus and on the course calendar. If you are having trouble keeping up with course material, please feel free to download the Brightspace Pulse app for course calendar reminders.

Late Assignments: No late work or make-ups are allowed for exams or active learning discussions (ALDs). All due dates are listed clearly in the course calendar, so you will need to plan your schedule accordingly to get assignments completed on time. Late project assignments are penalized at a rate of 10% off per day late, including weekends. No late assignments will be accepted in excess of **one week** past the original due date.

Course schedule (subject to change, with ample previous notice)

Week/Module	**Topic**	**Readings & Audio**	**Assignments: (all due at 11:30 PM on the Sunday at the end of the week)**
Week 1	Welcome + Getting Started	Read all content in Welcome + Getting Started Module	**Complete:** Introduction Discussion Post
Week 1:	Practical issues Then Probability, as it should be	Video Lectures MPP Handout on probability MPP Handout on Bayes	Weekly Quiz 1 Class Discussion 1
Week 2:	Bayes rule Pure logic	Video Lectures MPP Handouts on logic	Weekly Quiz 2 Class Discussion 2

	Some probabilistic fallacies	Kahneman's Chapter 25 "Bernoulli's error"	
Week 3:	Subjective Expected Utility (SEU)The axioms and Violations of SEU	Video Lectures Kahneman's Chapter 29 "The fourfold pattern"	Class Discussion 3 [no Quiz]
Week 4:	Prospect Theory	Video Lectures Kahneman's Chapter 26 "Prospect theory"	Quiz 3 (M3 + M4) [no discussion]
Week 5: Midterm Exam No lectures this week	On all we have seen so far		**Midterm Exam due**
Week 6:	Game Theory (norms and spontaneous choices)	Video Lectures Optional Reading: Rationality and Game Theory, Cristina Bicchieri	Class Discussion 4 **Start preparing for the final**
Week 7:	Neuronal Bases of Decision Making	Video Lectures On Phineas Gage, Simple readings on brain evolution	Quiz 4 (final quiz) Class Discussion 5 (final discussion) Material for the final
Week 8:	Preparation for Final Exam	Video Lectures **Study guide for the final**	**Final exam due May 10th 11:30pm**

CGSC 305

Bilingual Language and Learning: Terms, Processes, and Impact

Spring 2024

3 units

Genesis D. Arizmendi, PhD, CCC-SLP Assistant Professor (she/her/ella) Speech, Language & Hearing Sciences and Cognitive Science genesis@arizona.edu **Office**: SLHS 336 / (520) 626-1946 **Course site**: D2L	**Schedule:** TBD **Location**: TBD **Format**: In-person lecture, group activities, + discussion **Office Hours:** TBD

Welcome to CGSC 305: I'm so thrilled that you have elected to take this course!

Course Description: In this course, we will discuss the intersection of bilingualism, cognition, and academic achievement. Key connections between the principles of language development and acquisition processing in the first and second language, cognitive underpinnings and processes, and the practical societal impact on a learners' academic success will be addressed.

Throughout the course, we will discuss the theoretical frameworks underpinning bilingual language acquisition, sociocultural influences on communication patterns, and the implications of nonmainstream dialects in various cultural contexts. Emphasis will be placed on understanding the cultural, social, and linguistic factors influencing communication and the presentation of difficulties with language.

We will dissect the cognitive processes involved in language development and acquisition, analyzing how they manifest in both the first and second language (L1/L2). Moreover, our discussions will extend beyond theoretical frameworks to address the practical societal impact of bilingualism on learners' academic success. By examining real-world scenarios and case studies, we will explore how bilingualism manifests in educational settings and influences broader societal dynamics. The goal is to equip students with a holistic perspective, enabling them to appreciate and apply the insights gained in their own personal and professional lives and better preparing students as a global citizen.

Land Acknowledgement: In Tucson, Arizona, we respectfully acknowledge that we are on the traditional lands of the Tohono O'odham Nation and the Pascua Yaqui Tribe. We honor the enduring connection of these Indigenous communities to this land, which holds profound cultural, spiritual, and historical significance. We express gratitude for the land, water, and resources that sustain us, acknowledging the continued resilience and contributions of the Tohono O'odham and Pascua Yaqui peoples to this region.

Course Objectives:

1. Understand the relationship between bilingualism, cognition, and academic achievement.

2. Analyze language development and acquisition processes in both the first and second language.
3. Evaluate theoretical frameworks guiding bilingual language acquisition.
4. Examine sociocultural influences on bilingual communication/dialectal patterns and language difficulties.
5. Apply insights from theoretical discussions to real-world scenarios, preparing students to navigate diverse linguistic and cultural contexts effectively.

Student Learning Outcomes: Upon completion of this course, students will be able to:

- Describe key terms in the field of bilingualism
- Summarize bilingual language development processes
- Analyze cognitive processes underpinning language development and performance
- Identify and understand cultural, social, and linguistic factors influencing communication
- Analyze the practical societal impact of bilingualism on learners' academic success
- Integrate gained insights into personal and professional spheres

Office hours: Office hours will be held regularly, X from X. If meeting after class does not work well for you, please schedule an appointment on Calendly to find a good time to meet virtually via Zoom.

Class communications: All forms of communication are recognized as valid and are welcomed in and out of class. I will post course communications through D2L and email. Please give me 48 business hours (i.e., 2 week days) to respond to email. I always welcome and appreciate follow-up communications if you have not yet received a response after this window.

Required Materials: Journal articles and chapters from books will be uploaded to D2L. Journal articles will come from journals in the American Speech, Language, and Hearing Association (LSHSS, AJSLP, JSLHR), the National Association for Bilingual Education Bilingual Research Journal, or other journals focused on Bilingual Development. Chapters might include readings from Language, Learning, and Disability in the Education of Young Bilingual Children by Castro and Artiles, 2021 (free on UArizona Libraries) and Bilingual Language Development and Disorders by Goldstein, 2022 (free on UArizona Libraries).

How will your learning be assessed?
The assessment of your learning will be practical and designed to evaluate various aspects of your understanding, application, and critical thinking. **I will provide more detailed instructions and rubrics for each assignment on D2L.**

<u>All Students</u>
Readings: To get the most out of group work, personal reflection, and discussions during class, you can start learning the material before class through assigned readings.

Weekly Reflections: Each week, you're required to submit a reflective response related to the week's topics, discussions, or readings. Reflect on your understanding, insights gained, and connections made between the course material and real-world applications. You will submit a total of 10 reflections (300-500 words each) over the course of the semester. More details will be posted on D2L.

In-class assignments: In-class assignments are graded to foster accountability, collaboration, and engagement with the class material. Your participation will help you process the material you've learned, lead to better retention and application of the key concepts, and improve your cultural competence. These are due in class on the day of the assignment.

Cultural Excursion: To increase your knowledge base of cultures other than your own, you will be asked to engage and reflect on two cultural excursions. "Cultural excursions, or multicultural "step outs" (Gallavan & Webster-Smith, 2012), are situations, experiences, or events (that you plan or spontaneously find yourself in), that are outside of your cultural and/or linguistic knowledge base". You may write a report (1 page max), record yourself (5-10 minutes), or create an infographic or graphic organizer. Please see D2L for more details. **Extra Credit Opportunity:** For extra credit, you may complete another cultural excursion for an additional 2.5% of the total points each. These are due by the end time of the final exam.

Mastery Checkpoints: The Mastery Checkpoints are learning milestones designed to assess your understanding of fundamental concepts covered in three core sections of the course. Each checkpoint (4 total) will give you the opportunity to revisit and demonstrate your mastery of key principles and practical considerations discussed in lectures, readings, and class discussions.

Lit Dive: As part of this assignment, you will find 3 research articles on bilingual populations and determine how the authors are determining bilingual status, descriptions of the participants' bilingualism, and what measures or data the research team used to describe language skills. You will then provide a brief report on your findings and provide a reflection of what this might mean for the field of bilingualism. Please see D2L for more details.

Research to Public Science: We know that the world of science can be complex. As part of this assignment, you will develop two infographics based on a topic of your interest in the field of bilingualism that accurately describes key content, avoids jargon, and is accessible to the public. Please see D2L for more details.

Late work

It is most important that you do well on and learn from your assignments. Therefore, if you need an extension on an assignment, please reach out to me at least 48 hours in advance of the assignment due date and **tell me when within the week you plan to submit the assignment**. If you foresee any issues impacting your ability to do well in class, please let me know as soon as possible. Given that quizzes are intended to help you prepare for a class lesson, there will be no extensions on the quizzes. I will not be able to provide extensions on the final project due to the timeline to submit grades.

Grading Scale and Policies

The final grade will be calculated based on a weighted average and will follow a standard grading scale: A = 90.0-100%, B = 80.0-89.99%, C = 70.0-79.99%, D = 60.0-69.99%, E = < 60.0%. The weights will be calculated as follows:

ASSIGNMENT DUE DATES + GRADE WEIGHT

Assignment	Due Date (all due by 11:59pm AZ, unless otherwise specified)	Weight
All Students		
Weekly Reflections	Sundays	10%
In Class Assignments (10 total)	In class	15%
Cultural Excursions	Week 7, Week 11	15%
Mastery Checkpoints	Weeks 4, 8, 12, 16	40%
Research to Public Science	Week 5	10%
Lit Dive	Week 14	10%

Final Examination
The date and time of the final exam, along with a link to the Final Exam Regulations and Final Exam schedule, https://registrar.arizona.edu/faculty-staff-resources/room-class-scheduling/schedule-classes/final-exams

Course Schedule:

Day	Date	Topic	Readings (do before class)	Due
T	8/27/24	Introduction, set up course Defining key terms: What is bilingualism?	Syllabus – in class	
Th	8/29/24	Defining key terms: What is bilingualism?		
T	9/3/24	Myths about bilingualism		
Th	9/5/24	Theoretical frameworks		
T	9/10/24	Family/cultural communication patterns		
Th	9/12/24	Bilingual educational models		
T	9/17/24	Bilingualism in the schools (overview)		**Checkpoint 1**
Th	9/19/24	Determinants of health & language		
T	9/24/24	Determinants of health & language		Research to Public Science
Th	9/26/24	Bilingualism and cognition: Pediatric		
T	10/1/24	Bilingualism and cognition: Pediatric		
Th	10/3/24	Language development: principles		
T	10/8/24	Bilingual language development		Cultural Excursion
Th	10/10/24	Bilingual language development and best practices		

T	10/15/24	Review		**Checkpoint 2**
Th	10/17/24	Code-switching		
T	10/22/24	Code-switching		
Th	10/24/24	Multidisciplinarity in bilingualism - SLP		
T	10/29/24	Multidisciplinarity in bilingualism – School Psychology		
Th	10/31/24	Multidisciplinarity in bilingualism – Brain sciences		
T	11/5/24	Multidisciplinarity in bilingualism – General Education		
Th	11/7/24	Multidisciplinary in bilingualism – Special Education		Cultural Excursion
T	11/12/24	Considerations for collaboration - professionalism		
Th	11/14/24	Bilingualism and cognition: Adults		
T	11/19/24	Bilingualism and cognition: Adults		
Th	11/21/24	Bilingualism and cognition: Adults – acquired disorders		**Checkpoint #3**
T	11/26/24	Bilingualism and cognition: Adults – acquired disorders		
Th	12/3/24	Critical eye in research		Lit Dive
T	12/5	Educating		
Th	12/10	Advocating		
FINAL DATE				**Checkpoint 4**

** This syllabus is considered a "living document," subject to updates and revisions. The instructor may modify content, assignments, and deadlines to enhance and optimize the classroom learning experience.*

UA Course Policies

For information on UA's policies, such as attendance, threatening behavior, accessibility and accommodations, the code of academic integrity, and nondiscrimination and anti-harassment policy, please visit this link: https://catalog.arizona.edu/syllabus-policies

UA Academic policies and procedures are available at http://catalog.arizona.edu/policies.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Incomplete (I) or Withdrawal (W)

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete and http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal respectively.

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Wellbeing Statement

As a student, you may experience stressors that impact your academic career and personal well-being. These can include but are not limited to, academic pressure, mental and emotional health, challenges associated with relationships, alcohol or drug misuse, identities, financial challenges, etc.
Pay attention to your personal signs that you're overly stressed, like changes in your mood, appetite, sleep, behavior, or new physical symptoms (aches, pains, etc.) that interfere with school and daily life. If you or a friend is struggling, we strongly encourage you to seek support. Seeking help is a courageous thing to do for yourself as your well-being is important. The University of Arizona offers multiple resources to promote your well-being and success as an individual. If you are struggling with this class, please visit during office hours or contact me by email.

What are some resources I can utilize for learning or other needs?

- **Accessibility and Accommodations**: At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, **https://drc.arizona.edu/)** to establish reasonable accommodations.

- **Academic advising:** If you have questions about your academic progress this semester, please reach out to your academic advisor (https://advising.arizona.edu/advisors/major). Contact the Advising Resource Center (https://advising.arizona.edu/) for all general advising questions and referral assistance. Call 520-626-8667 or email to advising@arizona.edu.

- **Academic Skills**: If you'd like to learn more about time management, reading strategies, learning strategies, exam strategies, online strategies, and well-being, you can peruse the Think Tank website: https://thinktank.arizona.edu/academic-skills/resources This PDF infographic of study skills may also be useful: https://teachingmodels.arizona.edu/sites/teachingmodels.sites.arizona.edu/files/2020-08/Study%20Skills.pdf You can hone your writing skills with appointments, workshops, and resources from the writing center: https://thinktank.arizona.edu/writing-center

- **Cultural Competence**: ASHA has a nice definition and list of resources on cultural competence if you would like to know more or share with others. https://www.asha.org/practice-portal/professional-issues/cultural-competence/

- **Life challenges:** If you are experiencing unexpected barriers to your success in your courses, please note the **Dean of Students Office** is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at (520) 621-2057 or DOS-deanofstudents@email.arizona.edu.

- **Physical and mental-health challenges**: If you are facing physical or mental health challenges this semester, please note that **Campus Health** provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the **Counseling & Psych Services** (CAPS) 24/7 hotline, call (520) 621-3334.

- **Survivor Advocacy Program** https://survivoradvocacy.arizona.edu/
  The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support. Email: survivoradvocacy@email.arizona.edu Phone: 520-621-5767

- **Campus Pantry** Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries at no cost. Please see their website at: *campuspantry.arizona.edu* for open times.

- **Preferred Gender Pronoun** This course affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is on the class roster, please let me know. Feel free to correct instructors on your preferred gender pronoun. If you have any questions or concerns, please do not hesitate to contact me directly in class or via email (instructor email). If you wish to change your preferred name or pronoun in the UAccess system, please use the following guidelines:
  Preferred name: University of Arizona students may choose to identify themselves within the University community using a preferred first name that differs from their official/legal name. A student's preferred name will appear instead of the person's official/legal first name in select University-related systems and documents, provided that the name is not being used for the purpose of misrepresentation. Students are able to update their preferred names in UAccess.
  Pronouns: Students may designate pronouns they use to identify themselves. Instructors and staff are encouraged to use pronouns for people that they use for themselves as a sign of respect and inclusion. Students are able to update and edit their pronouns in UAccess.
  More information on updating your preferred name and pronouns is available on the Office of the Registrar site at https://www.registrar.arizona.edu/.

- **Confidentiality of Student Records** http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa

CGSC 410
Visual Cognitive Neuroscience and Models
University of Arizona
UA Online

Course Instructor:
Sarah Cook, PhD
PAS 556
sarahcook@email.arizona.ed

Office Hours (through zoom):
available by appointment
Email response time will be within 24 hours

Graduate Teaching Assistant:
(Name)
(Office Location)
(Email)

(Office Hours)

Course Overview:

How does the brain convert light waves hitting the retina into the visual world we perceive every day? What are the different neural mechanisms used to achieve these aspects of visual processing, and how can we model them using computational modeling? This course will cover the various neural correlates of visual cognition, and the computational models used to describe how we perceive the visual world around us.

Course Objectives:

This course will cover the following topics:

1. Principles of Computational Modeling
2. Neural and Computational Mechanisms of Attention, Object Recognition, and Visual Search
3. The Pupil as a marker of cognitive processes
4. Social Saliency in Visual Attention
5. Visual Illusions and Visual Disorders
6. The Influence of Neuroscience on Robotic Vision

Expected Learning Outcomes:

Upon the completion of this course, students should be able to….

1. ***Interpret*** the results of scientific literature exploring the behavioral paradigms and neural correlates of visual cognition
2. ***Describe*** the neural mechanisms corresponding to visual attention, object recognition, and visual search
3. ***Describe*** how the pupil can be a marker of cognitive processing
4. ***Illustrate*** the mechanisms of various computational models of vision

5. ***Implement*** a computational model of vision using MATLAB

Course Materials:

Zhao, & Zhao, Qi. (2017). *Computational and Cognitive Neuroscience of Vision* (1st ed. 2017.).

Students will have free access to this textbook using the University of Arizona library.

Classroom Format:

This is a 100% online and asynchronous course, meaning that there will be no regularly scheduled meeting times. Students will follow a course calendar, outlining all of the scheduled activities and assignments students should complete each week throughout the semester. The D2L course management system will be used to conduct the course. I will provide regular reminders through email and announcements on the D2L course site, but it is ultimately the responsibility of the student to progress through the course and complete all assignments by the required deadlines. **To participate in this fully online course, students must have daily, reliable access to D2L.**

Grading:

1. Quizzes (7 @ 15 points each, worth up to 105 points)

These quizzes will test and provide feedback on your basic understanding of the course material. The quizzes will be randomized and pulled from a bank of multiple-choice questions, and you will be able to retake the quizzes as many times as you would like up until the completion deadline. Only the highest score will be counted towards your final grade. These quizzes will provide you with low stakes opportunities to test your knowledge and readiness for the upcoming exams. Completion deadlines for the quizzes can be found in the course assignments calendar on d2l. Links for each quiz can be found inside the associated module in D2L, or under the "Quizzes" tab in D2L.

2. Discussions (7 @ 20 points each, worth up to 140 points)

You will have a total of 10 discussion prompts to be completed through the course of the semester. Each discussion will ask you to apply the knowledge that you've learned and engage actively with the course material. You should reply to at least one of your classmate's posts as a part of each discussion. Completion dates can be found in the course assignments calendar on D2L. Links for the discussions can be found in the associated module in D2L, or in the "Discussion" tab in D2L.

3. Exams (3 @ 100 points each, worth up to 300 points)

There will be three required exams, to be completed independently. While you will have access to your notes and course materials, I strongly suggest that you prepare for the exams as if they are closed book. You will only have 60 minutes to complete each exam, and you will not have enough time to look up every answer. Exams will consist of a mix of multiple choice and short

answer questions. You will have a completion window for each exam, which can be found in the course assignments calendar on d2l. Links for each Exam can be found inside the associated module in D2L, or under the "Quizzes" tab in D2L.

4. Modeling Project (3 mini assignments @ 75 points each, worth up to 225 points)

You will complete a modeling project, broken down into three mini assignments through the course of the semester. Completion dates can be found in the course assignments calendar on D2L. Instructions for each mini assignment will be available in the associated module in D2L or can be found under the "Assignments" tab in D2L.

Letter Grade Distribution:

770 – 693 points	A	90 - 100%
692 – 616 points	B	80 - 89.9%
615 – 539 points	C	70 - 79.9%
538 – 462 points	D	60 - 69.9%
461 – 0 points	E	Below 60%

Course Calendar:

Week	Dates	Topic	Readings	Assignments
1		Course Introduction	Textbook Chapters 2, 4	Quiz 1 Discussion 1
2		Object Recognition	Textbook Chapter 3, 5	Quiz 2 Discussion 2
3		Review for Exam 1 Pupillometry	Textbook Chapter 7	Quiz 3 Discussion 3 Exam 1
4		Visual Search Social Saliency	Textbook Chapters 6, 8	Quiz 4 Discussion 4 Mini Assignment 1
5		Modeling Attention Review for Exam 2	Textbook Chapter 12	Quiz 5 Discussion 5 Exam 2
6		Visual Illusions Visual Disorders	Textbook Chapters 10, 13	Quiz 6 Discussion 6 Mini Assignment 2
7		Memory and Vision Neuroscience and Robotics	Textbook Chapters 9, 11	Quiz 7 Discussion 7
8		Review for Final Exam		Exam 3 Mini Assignment 3

Course Policies:

Classroom behavior policy: This is a fully remote, 100% online course, which includes communication with instructors and peers through email, discussion forums, and web conferencing. Students are expected to act in a respectful and professional manner. The presentation of differing views and perspectives as they relate to course content is encouraged but must be done in a respectful manner. Any disparagement of others' views is unacceptable. All written communication should be checked for spelling and grammar. See the following for more information: https://deanofstudents.arizona.edu/disruptive-behavior

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http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students

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are made, they will be provided immediately in writing to students via posting to the D2L course website.

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Late Assignments: No late work or make-ups are allowed for exams or active learning discussions (ALDs). All due dates are listed clearly in the course calendar, so you will need to plan your schedule accordingly to get assignments completed on time. Late project assignments are penalized at a rate of 10% off per day late, including weekends. No late assignments will be accepted in excess of **one week** past the original due date.

Listen

Multisensory Perception
University of Arizona
UA Online

Course Instructor

Sarah Cook, PhD: sarahcook@arizona.edu [Link: mailto:sarahcook@arizona.edu]
PAS 556
Office Hours (through Zoom): available by appointment
Email response time will be within 48 hours

Course Overview

Every day we use our five senses of sight, touch, taste, smell, and hearing to construct our world. How do these senses interact with each other? How does what we feel influence what we taste? How do the senses of vision and touch combine to help us recognize objects? This course will explore the interaction between the senses and the associated neural underpinnings of these interactions.

Course Objectives

This course will cover the following topics

This course will cover the following topics:

1. Development of Multisensory Perception
2. Computational Modeling of Multisensory Perception
3. Multisensory influences on body perception and flavor perception
4. Cross-modal Interactions
5. Synesthesia
6. Evidence from Blindness and Deafness

Expected Learning Outcomes

Upon the completion of this course, students should be able to:

1. Identify the cross-model mechanisms involved in cognitive processes such as object perception, body perception and flavor perception
2. Describe how multisensory processing develops in healthy individuals
3. Describe computational theories of multisensory perception
4. Explain what synesthesia is and how it develops
5. Evaluate evidence from blindness and deafness in terms of what it reveals about multisensory processing

Course Materials

Sathian, & Ramachandran, V. S. (2019). *Multisensory Perception*. Elsevier Science & Technology.

Students will have free access to this textbook using the University of Arizona library.

Classroom Format

This is a 100% online and asynchronous course, meaning that there will be no regularly scheduled meeting times. Students will follow a course calendar, outlining all of the scheduled activities and assignments students should complete each week throughout the semester. The D2L course management system will be used to conduct the course. I will provide regular reminders through email and announcements on the D2L course site, but it is ultimately the responsibility of the student to progress through the course and complete all assignments by the required deadlines. **To participate in this fully online course, students must have daily, reliable access to D2L.**

Grading

1. H5P Interactive Presentations (12 @ 7 points each, worth up to 84 points)

Throughout the course, you will have learning activities that ask you to view course material and respond to a variety of questions related to the content and your understanding. These interactive lessons offer you the opportunity to practice and check your knowledge, helping you to study for exams.

2. Discussions (7 @ 20 points each, worth up to 120 points)

You will have a total of 7 discussion prompts to be completed through the course of the semester. Each discussion will ask you to apply the knowledge that you've learned and engage actively with the course material. You should reply to at least one of your classmate's posts as a

part of each discussion. Your lowest discussion grade will be dropped from your final grade. Completion dates can be found in the course assignments calendar on D2L. Links for the discussions can be found in the associated module in D2L, or in the "Discussion" tab in D2L.

3. Exams (3 @ 100 points each, worth up to 300 points)

There will be three required exams, to be completed independently. While you will have access to your notes and course materials, I strongly suggest that you prepare for the exams as if they are closed book. You will have 120 minutes to complete each exam. Exams will consist of multiple choice questions. You will have a completion window for each exam, which can be found in the course assignments calendar on d2l. Links for each Exam can be found inside the associated module in D2L, or under the "Quizzes" tab in D2L.

4. Writing Assignments (3 @ 75 points each, worth up to 225 points)

You will complete three writing assignments through the course of the semester. These assignments will be based on course materials and are intended to foster critical thinking and application of course concepts. Completion dates can be found in the course assignments calendar on D2L. Prompts for each writing assignment will be available in the associated module in D2L or can be found under the "Assignments" tab in D2L.

Letter Grade Distribution

Points	Letter Grade	Percentage
729 – 657 points	A	90 - 100%

656 – 584 points	B	80 - 89.9%
583 – 511 points	C	70 - 79.9%
510 – 438 points	D	60 - 69.9%
437 – 0 points	E	Below 60%

Course Calendar

Week	Dates	Topic	Readings	Assignments
1	7/1 - 7/7	Course Introduction Philosophical Insights	Bruno & Pavani 2018 (Sections 1.1 - 1.4), Textbook Chapter 2	Discussion 1
2	7/8 - 7/14	Object Perception Body Perception	Chapters 7, 8	Discussion 2 Assignment 1
3	7/15 - 7/21	Review for Exam 1 Flavor Perception	Chapter 10	Exam 1 Discussion 3
4	7/22 - 7/28	Audio-Visual Interactions Visual-vestibular interactions	Chapters 9, 11	Discussion 4 Assignment 2
5	7/29 - 8/4	Synesthesia Review for Exam 2	Chapter 12	Discussion 5 Exam 2
6	8/5 - 8/11	Development Models of multisensory integration	Chapters 4, 5	Discussion 6 Assignment 3
7	8/12 - 8/16	Evidence from blindness Mirror Therapy	Chapters 15, 16	Discussion 7 Exam 3

Course Policies

Classroom behavior policy: This is a fully remote, 100% online course, which includes communication with instructors and peers through email, discussion forums, and web conferencing. Students are expected to act in a respectful and professional manner. The presentation of differing views and perspectives as they relate to course content is encouraged but must be done in a respectful manner. Any disparagement of others' views is unacceptable. All written communication should be checked for spelling and grammar. See the following for more information:
https://deanofstudents.arizona.edu/disruptive-behavior [Link: https://deanofstudents.arizona.edu/disruptive-behavior]

Threatening behavior: The University seeks to promote a safe environment where students and employees may participate in the educational process without compromising their health, safety or welfare. The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self. Threatening behavior can harm and disrupt the University, its community and its families. Please see the following document for more information:
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Academic Integrity: The University student code of

Academic Integrity: The University student code of Academic Integrity prohibits plagiarism in any and all class assignments and activities in this course. Please see the following document for more information: https://deanofstudents.arizona.edu/policies/code-academic-integrity [Link: https://deanofstudents.arizona.edu/policies/code-academic-integrity]

Nondiscrimination and Anti-Harassment policy: Our online classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others. The University is committed to creating and maintaining an environment free of discrimination; see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Activity Details | Completion Summary

Visible

Required: Automatic

View this topic to complete the activity

Multisensory Perception Syllabus.html - Last Modified Jul 24, 2024 12:21 PM

CGSC 320 Spring 2024
University of Arizona
UA Online

Course Instructor:
Sarah Seger
sarahseger@arizona.edu

Office Hours (through zoom):
available by appointment
Email response time will be within 48 hours

Course Overview: Cognitive science is the interdisciplinary study of mind. Some of the core topics are: What are mental representations and computations? How do we recognize objects and patterns? How do we pay attention, remember, imagine, or solve problems? How does language influence thought? What is consciousness and what does intelligence mean? How do feelings influence the cognitive operations of the mind? What is cognition like in non-human animals and in machines? Over the course of the semester, we will get a glimpse on how each discipline approaches these core questions about the mind.

Course Objectives and Expected Learning Outcomes:

Available on the NSCS website: https://www.nscs.arizona.edu/

Course Materials:

The textbook is Friedenberg, J., & Silverman, G. and Michael James Spivey (2022). *Cognitive Science: An Introduction to the Study of Mind*. 4th Edition. Sage Publications. The UA library has provided free access to the eBook here. The eBook is also accessible through the D2L course site in Library Tools.

Interactive presentations: Lecture material reviewing information from the textbook and/or journal articles.

Journal articles: Selected journal articles will be used to supplement the textbook. They will be available on the course D2L site.

Classroom Format:

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Grading:

1. Quizzes (60 %)

There will be 7 weekly quizzes testing your knowledge of the week's content. Links and deadlines for each quiz can be found inside the associated module in D2L, or under the "Quizzes" tab in D2L. The lowest quiz grade will be dropped from your final grade.

2. Discussions (30 %)

You will have a total of 7 discussion prompts to be completed through the course of the semester. Each discussion will ask you to apply the knowledge that you've learned and engage actively with the course material. Links for the discussions and completion dates can be found in the associated module in D2L, or in the "Discussion" tab in D2L.

3. Essay (10 %)

You will choose any topic related to cognitive science. This can be a topic covered in the course, or any other topic of your choosing pending the instructor's approval. For example, the topic of color perception, or the topic of memory. The essay will have 3 sections: **Topic**: In the first section, you should describe your topic. This should include a definition of your topic, as well as how this topic relates to cognitive science. You should demonstrate a good understanding of your topic in this section. **Select two approaches in cognitive science**: In this section, you should choose two different approaches in cognitive science (e.g. Cognition and Neuroscience, Social approach and AI approach). You should summarize what each approach adds when understanding your topic. For example, if your topic is color perception, you can talk about the neural underpinnings of color perception, as well as how language influences our perception of color. **Propose your own research**: In this final section, you should propose a research project that will address some question you have about your topic, using your chosen approaches from section 2. For example, you might propose a research project to study how language changes our brains to perceive different colors. This section should include your research question and your proposed study, including your methods and hypothetical results. A grading rubric for the essay is provided on the D2L website under the description for the Essay assignment.

Course Calendar:

Week	Dates	Topic	Readings	Assignments
1	1/10 - 1/16	Introduction to Cognitive Science The Philosophical Approach	• Bermudez 2014 • Textbook: - Chapter 1 (p.3-12) - Chapter 2	Discussion 1 Quiz 1 Due **1/16 at midnight**
2	1/17 - 1/23	The Cognitive Approach The Network Approach	• Stanford Encyclopedia: Modularity sections 1 and 2 • Prinz 2006 • Textbook:	Discussion 2 Quiz 2 Due **1/23 at midnight**

			- Chapter 7 (p.189-204)	
3	1/24 - 1/30	The Cognitive Neuroscience Approach: Vision The Cognitive and Neuroscience Approach: Attention	• Textbook: - Chapter 4 (p.86-107) - Chapter 6 (p.160-175)	Discussion 3 Quiz 3 Due **1/30 at midnight**
4	1/31 - 2/6	The Cognitive Neuroscience Approach: Memory The Cognitive Neuroscience Approach: Problem Solving	• Textbook: - Chapter 5 (p.111-143) - Chapter 6 (p.175-186)	Discussion 4 Quiz 4 Due **2/6 at midnight**
5	2/7 - 2/13	The Linguistic Approach I The Linguistic Approach II	• Textbook: - Chapter 9 (p.263 – 289) • Harris 2003	Discussion 5 Quiz 5 Due **2/13 at midnight**
6	2/14 - 2/20	The Linguistic Approach: Neurolinguistics The Evolutionary Approach	• Textbook: - Chapter 8 - Chapter 9 (p.289 – 292)	Discussion 6 Quiz 6 Due **2/20 at midnight**
7	2/21 - 2/27	The Social Approach The Emotional Approach	• Textbook: - Chapter 10 - Chapter 11 • Cowen & Keltner 2017 • Hinojosa 2017	Discussion 7 Quiz 7 Due **2/27 at midnight**
8	2/28 – 3/2	Essay Submission		Essay Submission Due **3/2 at midnight**

Course Policies:

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Absence and Class Participation Policy: Because this is an online course, absence and class participation will be assessed through the completion of required course assignments. Participation in the course is assessed through the completion of the discussions, where you will interact with your classmates in discussion of course material.

Accessibility and Accommodations:
It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268, email: uadrc@email.arizona.edu , http://drc.arizona.edu/) to establish reasonable accommodations.

Subject to Change Statement:
Information contained in the course syllabus, other than the grade policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor. If any changes are made, they will be provided immediately in writing to students via posting to the D2L course website.

Grade appeals:
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Late Assignments: You should complete the quizzes and discussion questions by the date specified in the course calendar. However, there is a grace period, where you will have up to 1 week after the quizzes and discussions are due to complete without penalty. After that, you will receive a letter grade penalty for each additional day.

CGSC 321: Methods in Cognitive Science
UA Online

Instructor: Sarah Seger
Email: sarahseger@arizona.edu
Office hours: by appointment

Course description: This course will introduce you to experimental methods in cognitive science and cognitive neuroscience by focusing on selected techniques (e.g., experiments, fMRI, EEG, neuropsychology, noninvasive neuromodulation, psychophysiology, neuropsychology, and modeling).

Class format: 100% Online

Course objectives and expected learning outcomes of CGSC 321
At a fundamental level,

- Identify what types of questions can be answered using cognitive science & cognitive neuroscience research methods.
- Define the common methodologies and experimental designs used in research in cognitive science and cognitive neuroscience.
- List the strengths and weaknesses of each method.
- Interpret and evaluate the results of experiments.
- Choose which method, or combination of methods, is best for answering a research question.
- Show understanding of the different methods and their applications by developing basic studies

WEEKLY ASSIGNMENTS

Reading Assignments and Lectures. Reading assignments and lectures will be posted on the class D2L site. They are all required unless otherwise noted.

To save you the cost of expensive textbooks, all assignments are free – they are chosen from open-source textbooks, from books and journals from the UA library, or from other online sources.

Weekly Quizzes. There will be weekly quizzes to accompany the content each week. These quizzes will help you to check your understanding to prepare for discussions and exams. They will be multiple choice and timed. You will have 2 attempts to complete each quiz. There will be 6 weekly quizzes. Each is worth 5 points, and your lowest score will be dropped.

Discussions. In 5 of our modules, you will be required to make a discussion post. There will be specific instructions provided for each post. Discussions will often involve generating a research question that you could investigate using the method reviewed that week. You will also need to discuss other details that are important to consider when creating a study (e.g., your variables,

subject assignment, how you present stimuli, etc.). You will also need to respond to a classmate following provided instructions. Each discussion (your post + a response to a classmate) is worth 10 points total, and your lowest score will be dropped. You can find the topics associated with discussion posts in the Course Schedule.

EXAMS

Learning will also be assessed through a **Midterm Exam** and **Final Exam**. These will also be multiple choice and timed. The midterm is worth 25 points and covers the content from the first half of the course. The final exam is worth 30 points, and it will be cumulative. Both exams will be available for multiple days, but once you open an exam you will need to complete it within an identified amount of time.

GRADING

Reading Quizzes (5 graded): 25 points
Discussions (4 graded): 40 points
Midterm Exam: 25 points
Final Exam: 30 points
Total: 120 points

LATE WORK POLICY

The weekly quizzes and discussion posts should be completed by the date specified on the calendar. However, there is a grace period, where quiz submissions and discussion posts will be accepted without penalty up until its associated exam. Refer to the d2L course site for final due dates for quizzes and discussions. There will be no makeups allowed for the midterm or final exam.

Final Exam Schedule:

https://registrar.arizona.edu/faculty-staff-resources/room-class-scheduling/schedule-classes/final-exams

Course Policies:

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Incomplete Grade Policy:

Incomplete grades will be given only in special circumstances as outlined in university policy as stated in “The University of Arizona Record General Academic Manual.”

Expected Grading Timeline:
All assignments will be graded within one week of their submission due date.

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Course Calendar:

Week	Dates	Topic	Assignments	Submission Deadlines
1	01/10 – 01/16	Experiments and Behavioral Methods	Week 1 Quiz Week 1 Discussion	
2	01/17 - 01/23	fMRI	Week 2 Quiz Week 2 Discussion	
3	01/24 - 01/30	EEG & iEEG	Week 3 Quiz Week 3 Discussion	Weeks 1,2,3 Quizzes and Discussions due **01/30 at midnight**
4	01/31 – 02/06	Midterm	Midterm	Midterm due **02/06 at midnight**
5	02/07 – 02/13	Neuropsychology and Noninvasive Neuromodulation	Week 5 Quiz Week 5 Discussion	
6	02 /14 – 02/20	Psychophysiology	Week 6 Quiz Week 6 Discussion	
7	02/21 – 02/27	Cognitive Modeling	Week 7 Quiz	Weeks 5,6,7 Quizzes and Discussions due **02/27 at midnight**
8	02/28 – 03/02	Final Exam	Final Exam	Final due **03/02 at midnight**

Brain and Language

CGSC 340

Description of Course

This course surveys the issues and methods in brain and language research. The topics include (but not exclusive of): Speech perception, speech production, visual word recognition, lexical semantics, compositional semantics, embodied cognition, syntax, discourse and conversation, non-literal language, literacy, language and thought, bilingualism and multilingualism, language and emotion, language and aging, and several state-of-the-art neural theories of language. In addition to topics, the course will also cover the basics of some widely used methods in this field, such as electrophysiology and neural imaging.

Course Prerequisites or Co-requisites

None

Instructor and Contact Information

Instructor name: Vicky Tzuyin Lai
Office location: Psychology 456
Telephone number: (520) 621-3443
E-mail address: tzuyinlai@arizona.edu
Office Hours: TBA
Teaching assistants: TBA
Course D2L site: TBA

Course Format and Teaching Methods

Web-delivered mini-lectures and content, asynchronous activities and discussions, web-delivered assessment, presentation, peer-assessment.

Course Objectives

Objective 1. Read selected contemporary research articles and book chapters on brain and language, post critical questions and comments on D2L for asynchronous activities and discussions.

Objective 2. Based on readings, narrow down one's research interests in this field, ask an empirical research question, find relevant research articles, and specify what has been done and what has not.

Objective 3. Write a research proposal that includes an empirical hypothesis, experiment design, and predicted outcomes.

Objective 4. Present their proposal as web-delivered content, peer-review other's proposals in class, incorporate feedback from others in the final proposal.

Expected Learning Outcomes

Outcome 1. Students will gain a critical understanding of the general topics and specific issues in the fields of psycholinguistics, cognitive neuroscience of language, and neurobiology of language.

Outcome 2. Students will have narrowed down their research interests and get a sense of which research direction they would want to pursue should they work as a scientist in this field.

Outcome 3. Students will have developed an empirical experiment proposal, through which they would learn the considerations and obstacles and how to overcome them.

Outcome 4. They will be able to present their research proposal clearly and coherently to a professional audience in this field.

Absence and Class Participation Policy

The UA's policy concerning Class Attendance and Participation is available at: https://catalog.arizona.edu/policy/courses-credit/courses/class-attendance-participation.

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, http://policy.arizona.edu/human-resources/religious-accommodation-policy.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: https://deanofstudents.arizona.edu/policies/attendance-policies-and-practices

Because this is an online and asynchronous course, attendance is counted based on whether students have watched the web-delivered content or done the assignments. Absences may affect a student's final course grade. If you are unable to participate in class online activities, please contact me as soon as possible. To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or disability@arizona.edu. If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

Makeup Policy for Students Who Register Late

Students who register late may make up missed attendance and participation. No new registration is allowed after the second week of this 7.5-week course.

Course Communications

Official UA email addresses and the course D2L site

Required Texts or Readings

List both required and recommended texts, books, articles, etc.; delineate required versus optional.

Availability: purchased, library reserve, or class handouts and D2L

Kemmerer, D. (2022). *Cognitive neuroscience of language*. Routledge.

Selected journal articles and book chapters will be available on the course D2L site.

Assignments and Examinations: Schedule/Due Dates

Participation. Read the assigned articles and post a question, comment, or discussion points for each of the readings on D2L under 'Discussions' on the assigned dates.

Essay. Brain and language in the news. Find a news article, track down the research articles behind the news article, verify the correctness of the news article, and write an essay about the experience.

Mid-term paper. Write a research proposal on a topic that is related to this course and of your interest. The proposal should include a literature review where you summarize what has been done and discuss at least 3 ideas that could be researched but have not been done.

Final Examination or Project

The date and time of the final exam or project, along with a link to the Final Exam Regulations and Final Exam Schedule, https://registrar.arizona.edu/faculty-staff-resources/room-class-scheduling/schedule-classes/final-exams

There is no final exam.

There will be a final project, in which students develop an experiment with hypothesis and predictions. Students would present and discuss it in class at the final presentation. After the final presentation, students would incorporate feedback from the final presentation and write it up as the final paper.

Grading Scale and Policies

Attendance/participation: 40%

Essay: 10%

Mid-term paper: 15%

Peer-review of mid-term paper: 5%

Final presentation: 10%

Peer-review of final presentation: 5%

Final paper: 15%

Extra credit: 2% if more than 80% of the students in class complete TCE

Late assignment policy: The essay and papers, if turned in 24 hours late, would only receive 50% of the graded grade. They will not be graded if after 48 hours late.

University policy regarding grades and grading systems is available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system.

Grading scale: A = 90-100 B = 80-89.9 C = 70-79.9 D = 60-69.9 E = 0-59

Incomplete (I) or Withdrawal (W):

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policy, which is available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system.

Dispute of Grade Policy

If you believe that there has been an error in grading, you must initiate a request for re-grading within 1 week of the date on which the grade was posted; otherwise the request will not be considered.

Scheduled Topics/Activities

List topics in logical units in a weekly/daily schedule, including assignment due dates and exam dates.

Week 1. Introduction and neuroscience methods

- Essay due

Week 2. Neural basis of visual word recognition and speech perception

Week 3. Lexical semantics, embodied semantics, and combinatorial semantics

Week 4. Neural basis of syntax vs. the Memory Unification Control model of language

- Mid-term paper due

Week 5. Figurative language

- Peer-review of mid-term paper due

Week 6. Emotion and language

- Final presentation due

Week 7. Linguistic Relativity

- Peer-review of final presentation due

Week 8. Open discussion

- Final paper due

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students.

Notification of Objectionable Materials

Recommended language, if applicable: This course will contain material of a mature nature, which may include explicit language, depictions of nudity, sexual situations, and/or violence. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Accessibility and Accommodations

Recommended language is provided on the Disability Resource Center website: http://drc.arizona.edu/instructors/syllabus-statement.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: https://deanofstudents.arizona.edu/student-rights-responsibilities/academic-integrity.

The University Libraries have some excellent tips for avoiding plagiarism, available at https://lib.arizona.edu/research/citing/plagiarism.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who

use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

Nondiscrimination and Anti-harassment Policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at http://catalog.arizona.edu/policies

Campus Health
http://www.health.arizona.edu/
Campus Health provides quality medical and mental health care services through virtual and in-person care.
Phone: 520-621-9202

Counseling and Psych Services (CAPS)
https://health.arizona.edu/counseling-psych-services
CAPS provides mental health care, including short-term counseling services.
Phone: 520-621-3334

The Dean of Students Office's Student Assistance Program
https://deanofstudents.arizona.edu/support/student-assistance
Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services.
Email: DOS-deanofstudents@arizona.edu
Phone: 520-621-7057

Survivor Advocacy Program
https://survivoradvocacy.arizona.edu/
The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.
Email: survivoradvocacy@arizona.edu
Phone: 520-621-5767

Preferred Name & Pronoun

This course affirms people of all gender expressions and gender identities. If you prefer to be called a different name than what is on the class roster, please let me know. Feel free to correct instructors on your preferred gender pronoun. If you have any questions or concerns, please do not hesitate to contact me directly in class or via email (instructor email). If you wish to change your preferred name or pronoun in the UAccess system, please use the following guidelines:

Preferred name: University of Arizona students may choose to identify themselves within the University community using a preferred first name that differs from their official/legal name. A student's preferred name will appear instead of the person's official/legal first name in select University-related systems and documents, provided that the name is not being used for the purpose of misrepresentation. Students are able to update their preferred names in UAccess.

Pronouns: Students may designate pronouns they use to identify themselves. Instructors and staff are encouraged to use pronouns for people that they use for themselves as a sign of respect and inclusion. Students are able to update and edit their pronouns in UAccess.

More information on updating your preferred name and pronouns is available on the Office of the Registrar site at https://registrar.arizona.edu/records-enrollment/personal-information/updating-personal-information.

Safety on Campus and in the Classroom

For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview

Also watch the video available at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy0000000000003560

Confidentiality of Student Records

http://www.registrar.arizona.edu/ferpa

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Tentative Syllabus

Fall 2024, COGS 500 / CGSC 400
Computing for the Research Lab, 3 credits i-Course

Instructor Information

Dianne Patterson, Ph.D.
dkp@arizona.edu (preferred contact method)
Office: BSRL, Room 235
RII Neuroimaging Staff Scientist
Phone: 520-621-8380 (Cognitive Science main number)
Program Coordinator Neuroimaging Methods Certificate

I grew up in Arizona but lived in Peru, Venezuela, and Mexico. I am married and have a grown son and grandson.

I earned a B.A. in Philosophy and M.A.in English from ASU, then an M.A. in Linguistics and Ph.D. in Psychology at the U of A. I worked with Irene Pepperberg and Alex the parrot and imaged the parrot's vocal mechanisms.

My experience imaging the parrot vocal tract later led me to work in neuroimaging, especially fMRI, and dMRI. I am especially interested in emerging standards, such as the Brain Imaging Data Structure (BIDS).

Course Communication

OpenClass Discussions: I prefer that communication be posted in the OpenClass Discussion so that everyone benefits. You can post anonymously to the OpenClass discussion if you are more comfortable that way.

- I monitor the OpenClass discussions daily. If you have a discussion question specifically for me, tag it with "prof", and I'll get to it soon. Otherwise, I want to ensure your classmates have an opportunity to provide feedback (so I'll hold off).

- I will post **announcements** to the OpenClass discussion to share information with the whole class.

Email: I'm always available by email (dkp@arizona.edu) and typically respond the same day. If the topic is personal, then email is the way to go.

Office Hours: By appt: I am happy to jump on Zoom and meet with you most days in the late morning or afternoon. This can be especially helpful if you are struggling with software, or want feedback on an idea for the final project. Email me and we'll set it up.

Course Description

Research labs need confident, productive, and organized lab members who can identify and solve hardware, network, and software problems. This friendly asynchronous 3-credit iCourse is ideal for students who would like to improve their abilities to contribute to research by enhancing their technical expertise and self-reliance.

Students with a broad range of backgrounds will benefit from the course and it does not assume you know anything about computers! You will need to be comfortable with D2L, and have a good internet connection. You will need to download Google docs.

Through both theoretical and hands-on practical lessons, students learn about computer hardware; file and operating systems; networking; Unix commands; programming (Bash, Python, and Matlab); data curation, version control (GIT and Datalad); containerization (Docker), relational databases (MS Access), and digital signal processing (including audio, images and video formats).

Teaching Methods and Learning Processes

The course is implemented in OpenClass, an online learning tool that organizes assignments into lessons, quizzes and reviews complemented by flashcards and a discussion forum. OpenClass sends you a weekly learner digest email of your progress. The digest summarizes your progress and indicates incomplete assignments and missed questions. Reviews and discussions give you the opportunity to share thoughtful responses with your classmates and me.

In addition to OpenClass, you will use Apporto Virtual machines, Google docs and Google Cloud Shell. Links are in the Course Technology Resources at the end of the syllabus.

The class also includes a final project which gives you the opportunity to explore a software tool in greater depth.

Course Prerequisites or Corequisites

No prerequisites or corequisites courses are required. Course Format and Teaching Methods
The course consists of lessons, reviews, practices, discussions, and a final project.
Software will be available online, but you will have the option of installing some software tools on your personal computer if you wish.

Course Objectives

- To teach you critical concepts and vocabulary related to computer hardware, software, and networking
- To teach you best practices for processing and curating data including version control tools for organizing and documenting projects in a research lab
- To teach you how to employ the Unix command line to work with scientific tools and produce reliable documented processing pipelines
- To teach you how to work with software containers (e.g. Docker)
- To teach you how and why relational databases can improve data processing
- To teach you how to be self-reliant and solve problems so you can be a confident and productive member of a research lab

Expected Learning Outcomes for Undergraduate Students

- You will be able to evaluate the compatibility and suitability of computer hardware components.
- You will be able to explain the relationship between file systems and operating systems.
- You will be able to apply networking concepts to troubleshoot networking issues.
- You will be able to operate the Unix command line tools to view, navigate, and manage files and directories.
- You will be able to describe programming concepts and how to apply them in Bash, Python, and Matlab.
- You will be able to properly organize a research project.
- You will be able to explain version control systems.
- You will be able to operate containerized software solutions.
- You will be able to expand your options for manipulating table data.
- You will be able to manipulate digital signals with Matlab.

Expected Learning Outcomes for Graduate Students

- You will be able to evaluate the compatibility and suitability of computer hardware components.
- You will be able to explain the relationship between file systems and operating systems.
- You will be able to apply networking concepts to troubleshoot networking issues.
- You will be able to operate the Unix command line tools to view, navigate, and manage files and directories.
- You will be able to configure your Unix environment.
- You will be able to describe programming concepts and how to apply them in Bash, Python, and Matlab.
- You will be able to properly organize a research project.
- You will be able to explain version control systems.
- You will be able to operate containerized software solutions.
- You will be able to expand your options for manipulating table data.
- You will be able to manipulate digital signals with Matlab.

Required Texts and Materials

There are no required texts and no additional costs. All software is free to you. You are required to complete the OpenClass assignments which includes reading the text, watching the videos and answering the questions. This is an online class: you will need reliable access to the internet.
Towards the end of most lessons there is a Resources section. These are optional materials that you may find useful.

Schedule of Topics and Activities

The class covers 10 broad topics:

Hardware Week 1

Goals:
This module should help you configure a computer for yourself or your lab, and purchase the correct cables. In addition, the concepts covered here, especially CPU, RAM, GPUs and storage, can be extended to configuring virtual machines, container resources, HPC jobs, and cloud computing resources.

Module Description:
I'll explain the internal components of your computer (CPUs, GPUs, RAM, Hard Drives, and motherboards), how to measure capacity and performance, and how to identify cables. I'll discuss the current state of computing and emerging trends, including GPUs and RISC chips.

Learning Objectives:
Evaluate computer hardware components for their compatibility with each other and their suitability for your needs.

- Explain the roles of computer hardware
- Describe measurement terms used for capacity and performance of computers
- Characterize hardware capacity
- Characterize hardware performance
- Identify peripherals and their roles
- Evaluate component compatibility

System Software Week 2

Goals:
This module should help you configure drives to be compatible with multiple platforms, and identify the pros and cons of these different platforms.

Module Description:
To prepare a drive for files and directories, you must format it with a **file system**. If the drive is formatted as "bootable", then it can hold an **operating system**, and be used to start the computer. The operating system provides the organizational structure and basic tools to access your files. Operating systems may be installed on physical or virtual drives. Later in the course, you'll use operating systems installed on virtual drives for practicums.

These are called virtual machines: Google Cloud shell instances are virtual machines, as are Apporto VCAT machines. You'll also use Docker containers, which are similar to virtual machines but have an advantage in size, speed, and portability.

Learning Objectives:
Explain the relationship between file systems and operating systems.

- Explain file system concepts (e.g. indexing systems, cluster size, fragmentation, and drive formatting).
- Compare operating systems (e.g. Windows, Mac, Linux).

Networking Week 2

Goals:
This module should help you identify and troubleshoot connectivity issues, and result in faster resolutions.

Module Description:
Networking involves both hardware and software, but all of us increasingly rely on the network to access resources. I'll discuss networking concepts ranging from IP addresses to virtual private networks. You'll have a practice to learn about troubleshooting network problems on your own computer.

Learning Objectives:
Apply networking concepts to troubleshoot networking issues

- Define networking concepts (e.g. IP address (static, dynamic, public, private), NIC, DNS and DHCP, LAN, NAT, VPN, Ports, IPV4, and IPV6).
- Troubleshoot networking issues

Unix Week 2, 3

Goals:
This module will help you work with a broader variety of scientific software, and form a solid basis for learning about programming.

Module Description:
A significant portion of scientific software is implemented on Unix and depends on the command line. Over several weeks, I'll get you started using the Unix command line in Google Cloud Shell. Emphasis will be on basic commands, directory structure, and permissions.

Learning Objectives:
Operate Unix command line tools to view, navigate, and manage files and directories.

- Explain the importance of the Unix command line
- Introduce Unix command line tools
- Explain and navigate the structure of the Unix directory tree
- Employ Google Cloud Shell
- Operate Unix command line tools
- Modify Unix permissions
- Apply glob patterns
- Configure your Unix environment
- Manipulate the search path

- Manipulate aliases
- Manipulate environment variables
- Read and write Unix scripts

Programming Week 4, 5

Goals:
This module will get you started with some programming languages, concepts, and tools that you are likely to encounter in scientific research.

Module Description:
I'll introduce basic programming concepts. I'll also explain open-source, package management systems, like Conda, and programming notebooks, like Jupyter. You'll have access to Conda through Google Cloud Shell, and Jupyter on Google CoLab. Conda and Jupyter are also available through the University's High-Performance Computing cluster, or you can download and install them for free.

Learning Objectives:
Describe programming concepts and how to apply them in Bash, Python, and Matlab.

- Explain the significance of Open source
- Describe programming constructs
- Read and write Bash scripts
- Operate code editing tools
- Install scientific tools
- Explain Package Management Concepts
- Manipulate Conda Environments
- Install Conda Packages
- Describe the significance of Jupyterlab
- Open and edit Jupyterlab notebooks

We'll be almost ½ way through the class at this point, and turn our attention to data.

Informatics Week 5

Goals:
This module introduces you to tools and best practices for how to organize a research project.

Module Description:
I focus on the FAIR principles of data management, and best practices for naming and organizing files and folders. I also introduce you to online data repositories and explain their increasing importance for scientific research.

Learning Objectives:
Organize a research project.

- Enumerate the FAIR principles
- Explain the importance of data repositories

- Document a research project
- Apply standardized naming best practices

Version Control Week 5

Goals:
This module introduces you to GIT and the related Datalad. You can use these tools to organize your own projects AND you can find GIT and Datalad repositories online that you can download and use freely.

Module Description:
Version control is a particular approach to data management. The emphasis is on tracking and annotating changes so you can roll back those changes if necessary. The well-known version control tool GIT facilitates tracking text files (like code) and is very useful for teams. Datalad is less well-known, but it is especially good at handling large files like images which would overwhelm a traditional GIT repository. There will be practice for Git, and DataLad.

Learning Objectives:
Explain version control systems.

- Manipulate a GIT repository.
- Manipulate a Datalad repository.
- Discover a repository on the internet
- Explain version control with GIT
- Explain version control with Datalad

Docker Week 6

Goals:
This module introduces you to containerized software. Containerized software can facilitate data processing and guarantee reproducibility far into the future.

Module Description:
Docker is a container technology that helps to address reproducibility issues. Containerized approaches to scientific processing are becoming more common, and you will learn about why that is true, and how to find and manipulate containers. There will be several Docker practice lessons.

Learning Objectives:
Operate containerized software solutions.

- Explain containerization and its importance
- Explain Docker containerization
- Differentiate Docker images and containers
- Describe Dockerhub
- Describe Dockerfiles
- Build a Docker image from a Dockerfile
- Employ Docker for running software
- Explain container isolation
- Explain bind mounts

- Construct bind mounts

Table Data Week 7

Goals:
This module expands your options for working with data in tables so that you can clean and extract data more efficiently.

Module Description:
No matter what area of research you are in, you will probably have tables of data. In this module, I'll explain relational databases, and I'll show you some great tools for data cleaning (Open Refine, Tableau Prep) and visualization (Tableau Desktop). Using Apporto, you'll have practices on Excel (a flat database), and Microsoft Access (a relational database).

Learning Objectives:
Expand your options for manipulating table data

- Explore tools for manipulating table data
- Explain relational database concepts (e.g. one-to-many relationships, joins, primary keys, queries, and SQL).
- Create pivot tables, and complex formulas in Excel.
- Create a Microsoft Access database employing design view, forms, and query-by-example

Digital Signal Processing Week 7, 8

Goals:
This module explains how sound, images and other data are represented and manipulated digitally, and provides a solid introduction to using Matlab to do those manipulations.

Module Description:
I'll finish the semester by discussing digital data, especially images like those produced by the MRI scanner. You'll have a practice on Matlab, a programming language that is especially good for handling such digital data. Matlab is available through Apporto. In addition, the University has a permissive Matlab license that allows you to install Matlab on any machine you own, and Matlab is available on the High-Performance Computing cluster.

Learning Objectives:
Manipulate digital signals.

- Distinguish image headers from image data
- Compare spatial resolution and bit depth
- Explain digital signal dimensionality
- Describe matrix math operations
- Explain compression algorithms
- Explain the RGB color model
- Compare the features of common image formats
- Explain the features of video formats and their importance
- Compare raster and vector graphics
- Describe 3D printing formats and tools

- Manipulate variables, matrices, and paths in Matlab

Assessments

Weekly Modules: 570 pts (~85% of your grade)

The bulk of your grade is based on completing lessons, practices, reviews, quizzes, and discussions in OpenClass. Assignments will be due twice weekly by 9 pm Mountain standard time. OpenClass will track your completion. You can work ahead, but you do have to complete some assignments before going on to others. The workload is about 6-8 hours per week, with some variation by week. Most assignments are graded based on your mastery of the material. Partial credit will be awarded for late work: 90% for submissions within 24 hours; 80% for submissions within 48 hours; 50% for submissions later than 48 hours. Assignments are graded automatically, but synchronized manually with D2L. I'll do this synchronization at least once a week. If you find you are a week behind, I urge you to drop the class! If you join the class after the start date, I expect you to catch up in the first week.

Discussions: 50 pts (required discussions=35 pts; encouraged discussion=15pts; ~7.5% of your grade)

Goal: Discussion is implemented in OpenClass. Discussion provides you with the opportunity to meet your classmates, go beyond the lessons by finding useful resources, and follow up on your own questions or those of others. Discussion topic tags and titles indicate the associated module and the "required" status. At the end of each lesson, you'll find links to the relevant discussion.

Be kind, supportive, and respectful to your classmates. I reserve the right to remove discussion posts that are offensive or disrespectful. You can and should report any post you find problematic to me.

- I will monitor the discussions frequently to ensure your posts get responses.
- I will endorse posts that meet the criteria for credit (see rubric below).
- You should monitor discussions to ensure you acknowledge and respond to feedback, and that you see announcements.
- Questions are welcomed in the discussion at any time, and you may post anonymously if desired.

Posts are of several types:

- Required discussion
- Encouraged discussion
- Announcements: I will make announcements, such as summarizing the results of each module. Feedback is welcome for announcements as well.

If you want immediate* direct feedback from me, create a **question**. I'll filter discussions to look for questions. See OpenClass Discussion Editor User Manaul for instructions on creating a question.
*"Immediate" will usually be within 24 hours. You can always **email me if you prefer**.

For all other discussions, I want to give your classmates a couple of days to provide feedback before I jump in.

Grading Rubric for Discussion Posts

To receive credit, I must endorse your post.

Endorsed posts will need the following features:

- Posts must be clearly written and grammatical (Read over and revise your post to ensure it makes sense and clearly addresses the relevant points). If I don't understand your post, I won't endorse it.
- Posts must be substantive. That is, you should engage and have something to say. You can expect posts should be at least a couple of sentences ("I don't know" or "NA" are not substantive).
- Posts must provide links to support your assertions or share your discoveries (unless you are just sharing an experience)

Feedback will be evaluated like posts, but here is some additional guidance:

- Please try to **choose someone who has not yet received feedback** so that all participants receive feedback from at least one other person.
- **If the post is a question**, feedback should attempt to answer the question (with relevant links if possible).
- **If the post shares a resource**, feedback should include looking at the resource and sharing your own view of it, e.g., how is it interesting or valuable? Does it inspire you to share another related resource (If so, please share that).
- **If the post shares an opinion or experience**, feedback should consider it thoughtfully and share your response, e.g., Have you had a similar experience? Does the post help you think in new ways, or realize something you hadn't thought about? Remember, keep feedback positive and encouraging.

Required Discussions

- Everyone must respond to the required discussion topics.
- Go Shopping (5 pts): This is a special discussion topic that requires some extra effort, so it is worth more points. The grading rubric is described in the question.
- Other required discussion topics (30 pts: 15@2 pts each).

Encouraged Discussions

- The remaining 15 points of discussion will be awarded for posts to "encouraged" discussion topics or feedback to your classmates. See the description below for undergraduates vs graduate students.

Undergraduate

- Respond to all required discussion topics.
- The remaining 15 points of discussion will be awarded for posts to "encouraged" discussion topics or feedback to your classmates. You will be awarded 1 pt for each such endorsed post (15 pts: 15 posts @1 pt).

Graduate

- Respond to all required discussion topics.

- The remaining 15 points of discussion will be awarded for posts to "encouraged" discussion topics or feedback to your classmates. You will be awarded 0.5 pts for each such endorsed post (15 pts: 30 posts @0.5 pt).

Final Project: 50 pts total (proposal=5 pts, project document=45 pts; ~7.5% of your grade)

All students must complete a final project. The project is an opportunity for you to take a deeper dive into a software topic discussed in class. This consists of a 5-point one-page proposal (which must be accepted by the instructor), and a 45-point project due on the last day of class as per the Final Exam Schedule. The proposal and project document must be submitted on D2L.

Goal: Research is about evaluating new tools and ideas! Being self-reliant will make you invaluable in a lab setting, because your supervisors will know they can give you a project and you will follow through, make good judgements and document what you do and why. The goal of this project is to empower you to take the lead and solve problems.

Learning Objectives: This project gives you the opportunity to apply skills, tools, and knowledge from this class to take a deeper dive into a related software topic:

- Determine your requirements so you can examine and select software you believe will address those requirements, and identify resources that help in that investigation.
- Determine how to evaluate that software, and then execute your evaluation plan.
- Compile information from your evaluation to determine whether the software suits your needs and why.

Undergraduate

Undergraduate projects should be about 5-pages, double-spaced.

Graduate

The project is held to a higher standard for graduate students and should be about 10 pages, double-spaced.

Proposal: Grading Rubric

The project will not be accepted unless you turn in a proposal and have it accepted first! The 1-2 page proposal should explain why you are interested in this particular topic and identify relevant resources. Feel free to meet with me or email me to discuss and clarify. The proposal will be graded based on the following rubric. In each case, the criterion is met or unmet.

- (1 pt) What software do you want to learn about? Provide a name, link, and description.
- (1 pt) What do you want to accomplish with this software? (i.e., Complete a tutorial? Solve a particular problem? Process particular data?)
- (1 pt) How does this software project align with the goals and topics of the class? (You do not need to use a tool you learned in the class, but you should work with something related to the class topics. Example topics are provided in the list below. Email me or message me in the discussion if you want to explore options).

- (1 pt) How does this software project align with your research interests? (The topic you choose should be relevant to your research interests and enhance your skill set / knowledge. This might be a software tool used in your current lab (if you have one), or a software tool you estimate would enhance your profile for prospective labs.
- (1 pt) You must include a resources section! This is different from a References Section! List websites, articles, or people that might help you accomplish your learning goals. List at least three resources and provide a sentence or two for each of them explaining why the resource might be valuable. Provide links to websites or articles and contact information (e.g., email) for any people.

Late policy: You will lose 1 point for each day your proposal is late.

Project Document: Grading Rubric

The project should report your personal journey learning and evaluating the software.
- (5 pts) Introduction Revise and expand on the proposal: Because you've learned more about the software, you have likely changed your view of (a) what you could accomplish with it, (b) how it aligns with the goals and topics of the class, and (c) how it aligns with your research interests.
- (15 pts) Analysis Describe your personal journey learning the software and using its documentation. I want to see evidence that you were persistent and you experimented. Describe the steps you went through as you worked with the software. Include (a) your difficulties, and their resolution (if any); (b) your successes, and (c) tips for others (or your future self).
- (15 pts) Evaluation Evaluate the software: (a) How was it useful? (b) How was it problematic or disappointing? (c) What are your next steps (e.g., abandon this software in favor of an alternative; revise your expectations about what you can realistically manage; revise your expectations about what the software can do; continue to invest time in learning the software, etc.)
- (10 pts) Resources List websites, articles, or people that help you accomplish your learning goals and/or that would be useful in the future. List at least five resources and provide a sentence or two for each of them explaining why the resource is (or is not) valuable to you. Provide links to websites or articles and contact information (e.g., email) for any people. This should be similar to the Resources section in the proposal, but because you've learned more about the software, you have likely changed your view about what resources actually helped, and you may have found additional resources.
Late policy: You will lose 1 point for each day your project is late.

Example Project Topics and Related Resources

- Unix (e.g., find online tutorials)
- Jupyterlab (How to Use Jupyter Notebook in 2020: A Beginner's Tutorial)
- GIT (e.g., Gitkraken)
- Datalad (e.g., Datalad Handbook)
- Organize a Project (e.g., Apply naming principles, put the project under GIT or Datalad control, create readme and changelog, etc.)
- Docker (e.g., Find software implemented in a Docker container and learn to use it, e.g., Neurodesk)
- Obsidian: organize your research/studies
- Tableau Desktop or Tableau Prep (Tableau Desktop Practicum and Data)
- OpenRefine (OpenRefine.org)
- Redcap (REDCap University of Arizona Training and Video Tutorials)

- Microsoft Excel
- Microsoft Access
- Matlab (Many interesting and valuable software tools are implemented in Matlab. Choose one and learn to use it)

Please email me or talk to me about any other topics you are considering! These are only examples and you may be interested in other software that is relevant to your research. Let me know what you are thinking because it is important that the project is interesting and relevant to you.

Grading Scale and Policies

(re-assess points after refactor: discussion may be different)
A 90-100% (603-670 pts)
B 80-89% (535-602 pts)
C 70-79% (467-534 pts)
D 60-69% (466-399 pts)
E 0-59% (Failing Grade)

Resources

Learning / Accessibility Resources

The **University of Arizona** provides support for learners in many ways. Here are some of the most relevant:
Data Science Institute provides training workshops in computational and data science skills, and opportunities to become a data science ambassador
Disability Resource Center provides accommodations
HPC Workshops Free workshops offered by our High Performance Computing staff
SALT Center Supports students with learning and attention challenge, provides tutoring
Student Assistance and Advocacy is a central support hub for all students at our university, aiming to assist with various challenges including personal crises, life traumas, health issues, and academic struggles
Student Resources supports the success of undergraduate students through individualized academic support, academic skill building, tutoring, peer mentoring, and creating community using strengths-based programming, evidence-based practices, and robust assessment.
Think Tank and University Tutoring Academic support services in person and online
U of A Accessibility email: accessibilty@arizona.edu

Google and **OpenClass** make every effort to ensure their tools are accessible. Consult the following documents that describe those accessibility statements:
Google Docs Accessibility Statement
Google Cloud Shell Accessibility Statement
OpenClass Accessibility Statement

Course Technology Resources

We will use several online tools during this course. The following sites provide key information about these tools:

Apporto How To Apporto is a service providing online virtual machines through the University of Arizona. Apporto will allow you to to use Excel, MS Access, and Matlab in exactly the same environment as your classmates.
Google Cloud Shell Practicum Google Cloud Shell is a free Unix terminal where you can practice using Unix, GIT and Docker.
OpenClass YouTube videos OpenClass is the primary tool you will use for your assignments. If you'd like to learn more about OpenClass features, this is a nice YouTube channel providing more information.
OpenClass Site D2L will have links to your OpenClass lessons directly. However, if you want to check out the main site, this is it.
OpenClass Discussion Editor Manual You can just type text in the discussion, but, if you want, you can format and color the text, insert tables, links and info panels. This is a Google Doc that explains how to use the editor in the Discussion sections to do some rich formatting.

Technical Support

UCATT: https://studenthelp.intech.arizona.edu/ Support related to classes, D2L and other learning tools
UITS: https://it.arizona.edu/get-support (626-TECH) General technical support

U of A Syllabus Policies

Final Exam Regulations
catalog.arizona.edu/syllabus-policies

Schedule Fall 2024 7.5 week session 1

Week	Start Date	Topics
1	Aug 25	Hardware
2	Sept 1	System Software, Networking, Unix
3	Sept 8	Unix
4	Sept 15	Programming
5	Sept 22	Programming, Informatics, Version Control
6	Sept 29	Docker, Table Data
7	Oct 6	Table Data, DSP
8	Oct 13	DSP

Proposal Due: Sept 20
Project Document Due: Oct 16 (last day of classes: Final Exam Schedule)

Neuroimaging Theory, Methods and Applications
COGS 505/ CGSC 405
Spring 2025, 3-credits

Description of Course

This course introduces students to neuroimaging from theoretical and practical perspectives. The course will concentrate on magnetic resonance imaging. We will review MRI physics and image acquisition concepts that are necessary to understand design of fMRI experiments, perform analysis, and to interpret results in the literature. We will discuss functional and structural neuroimaging approaches. Students will have an opportunity to acquire practical skills with some of the most commonly used neuroimaging data preprocessing, analysis and visualization software (i.e., SPM12, MRIcron, xjview, ITK snap). You will get a lot of practice with fMRI data preprocessing and analysis. To take advantage of the data analysis Tutorials you need laptop or desktop in good working condition, access to internet, ability to download files and install software.

Course Prerequisites

COGS 500: Computing for the Research Lab is required; NSCS 200: Basic knowledge of neuroanatomy and brain function is recommended
MATH 122A&B – First Semester Calculus: Basic math and computational skills are needed to complete the tutorials.

Instructor and Contact Information

Instructor: Aneta Kielar, Ph.D.
Office: SLHS 332
Email: akielar@arizona.edu
Office Hours: Monday and Wednesday 1-2 p.m. by appointment. I can meet over zoom and in-person meeting is also possible with appointment.

I earned B.Sc. In Psychology from the University of Toronto and M.A. and Ph.D. In Cognitive Psychology from the University of Western Ontario. Following that I completed postdoctoral fellowship in cognitive neuroscience and neuroimaging at Northwestern and Rotman Research Institute. My research integrates neuroimaging with neuromodulation in the treatment of post-stroke and progressive aphasias.

Course Format and Teaching Methods

Course Format: This class is delivered entirely in the online format and delivered through AZonline. The duration of this course is 7.5 weeks. This means that you take this class remotely on your own time and you don't need to come to class physically. This gives you a lot of flexibility, however, good time management is essential to stay up to date and to succeed in this course. Course materials will be posted on OpenClass and D2L for you to access at any time.

During most weeks students will complete four lessons through Open Class course site. Some of the lessons will require practical application of material. Step-by-step tutorials will company these practical applications. Each lesson will incorporate multiple choice questions that assess understanding of the material. Student answers to these questions will be graded and grades posted on D2L. There are two submissions per week Thursday by 11:59 p.m. and Sunday by 11:59 p.m. This gives you plenty of time to complete lessons each week. It is recommended that **you reserve 6-8 hours per week to work on the material. Some weeks may require more of less time. The exact time spent on the lessons will depends on the individua learning style.** You can work ahead. However, some lessons need to be completed sequentially. For example, you need to complete data preprocessing before you can proceed to statistical modelling. The due dates are there to help you stay current. Don't leave

Teaching Methods: This course consists of recorded lectures, Tutorials, Quizzes, and independent reading. Students are required to complete OpenClass lessons, quizzes, readings and tutorials that are posted on OpenClass and D2L course sites each week. Learners are responsible for material and announcements posted on D2L and through OpenClass.

The course is implemented in OpenClass, an online learning tool that organizes assignments into lessons, quizzes and reviews complemented by flashcards and a discussion forum. OpenClass sends you a weekly learner digest email of your progress. The digest summarizes your progress and indicates incomplete assignments and missed questions. Reviews and discussions give you the opportunity to share thoughtful responses with your classmates and me.

In addition to OpenClass, you will interact with various software and Google docs. The software that we will use in class is open source. Links on how to install specific software will be posted on D2L and OpenClass.

Course Objectives

During this course students will:

1) Learn concepts and terminology necessary to be able to read, understand and evaluate neuroimaging literature
2) Learn principles that underly image acquisition and functional neuroimaging
3) Learn best practices for design of fMRI experiments
4) Learn how to work with software such as MATLAB, SPM12, xjview, MRIcron
5) Learn how to preprocess and analyze fMRI data
6) Learn common types of statistical designs as they apply to fMRI data e.g., t-tests, factorial designs, regressions
7) Learn how to visualize and interpret results of fMRI analysis
8) Learn how to work with clinical data
9) Learn how to perform morphometric analysis of gray matter

Expected Learning Outcomes for Undergraduate Students

Upon completion of this course students will:

1) Become familiar with concepts relevant to the neuroimaging methodology

2) Become familiar with terminology required to understand neuroimaging literature and interpret results
3) Develop skills in experimental design as it relates to neuroimaging
4) Gain knowledge of brain imaging data organization
5) Gain skills in neuroimaging data preprocessing, model specification, statistical analysis, and visualization of results
6) Gain skills in working with lesioned brains
7) Be able to perform voxel based morphometry analysis

Expected Learning Outcomes for Graduate Students

Upon completion of this course students will:

1) Become familiar with concepts relevant to the neuroimaging methodology
2) Be able to apply concepts of MRI physics to practical problems
3) Become familiar with terminology required to understand neuroimaging literature and interpret results
4) Develop skills in experimental design as it relates to neuroimaging
5) Be able to evaluate optimal experimental design
6) Be able to apply principles of brain imaging data organization
7) Gain skills in neuroimaging data preprocessing, model specification, statistical analysis, and visualization of results
8) Gain skills in working with lesioned brains
9) Be able to perform voxel based morphometry analysis

Makeup Policy for Students Who Register Late

Students who register late are required to make up required readings, assignments or quizzes during the first week from the day of the registration. Arrangements should be made with the instructor ahead of the deadline if there are circumstances that prevent you from completing the assignments.

Course Communications

Online communication will be conducted via your official UA e-mail address. Course announcements will be posted on open class and D2L. Activate your announcement and email options on D2L so that you can receive important information.

I am always available by email (akielar@arizona.edu) and typically respond within 48h Monday to Friday. Usually, I don't monitor my emails on weekends and holidays.

Required Texts and Readings

To facilitate learning and provide a broader context to our lessons, slected chapters from textbooks listed below will be posted on the D2L course site:

Huettel, S.A., Song, A.W., & McCarthy, G. (2014). Functional Magnetic Resonance Imaging, 3rd Edition. Sunderland, MA: Sinauer.

Ward, J. (2015). The Student's Guide to Cognitive Neuroscience. 3rd Edition. Steven. J. Luck. (2014). An Introduction to the Event-Related Potential Technique

Required readings will be posted on D2L. Textbook chapters will be linked from the library Catalogue available from D2L.

Required or Special Materials

Equipment and Software Requirements: To take advantage of the resources provided in this class and complete required tutorials students will need daily access to the following hardware: laptop ordesktop computer, or web-enabled devices with webcam or microphone; regular access to reliable internet signal; ability to download and run software (e.g., web browser, Adobe Acrobat, google docs). Ability to download files. You will need to install MATLAB and SPM12. MATLAB is free for students at the University of Arizona and itcan be installed from here: https://www.mathworks.com/academia/tah-portal/university-of-arizona-30356115.html#new. Follow instructions on the UITS website and screen prompts during installation.

SPM12 is one of the main tools used for neuroimaging data analysis and it can be installed for free from here: https://www.fil.ion.ucl.ac.uk/spm/. SPM12 runs on theMATLAB platform.

Students need familiarity with basic computer operations and be able to independently download and run software and add toolboxes to the MATLAB path).

Assignments and Assessments

Content	Points	Description
Content Lessons: required for all students Lessons may consist of videos to watch, slides, text, articles and chapters to read, practical application tutorials, questions to answer.	Undergraduate and Graduate students: 30 lessons x 10 points each Total = 300 points (~79% of your grade)	During most weeks students will complete four lessons through OpenClass course site. Open Class **Lessons are the main format in which course content will be provided.** Some of the lessons will require practical application of material. Step-by-step tutorials will company these hands-on activities. Each lesson will include multiple choice questions and short answer responses. Student answers to these questions will be graded and grades posted on D2L. The required Lessons and Tutorials need to be completed fully to receive full points. There are 4 tutorials that are required for graduate students and optional for undergraduate students The workload is about 6-8 hours per week, with some variation by week. Most assignments are graded based on your mastery of the material. Partial credit will be awarded for late work: 90% for submissions within 24 hours; 80% for submissions within 48 hours; 50% for submissions later than 48 hours. Assignments are graded automatically, but synchronized manually with D2L. I'll do this synchronization at least once a week. Partial points may be awarded for incomplete or late assignments

Discussions: weekly required for all students	Each discussion is worth 5 points. Total = 30 points (~8% of grade) Discussions will be active each week and students are required to post responses to 6 out of 8 discussion topics to receive full credit. You are encouraged to participate more than that! **Graduate students**: to receive full points must provide meaningful feedback to one of the classmates	Goal: Discussion will be open each week and will concern with topics covered in the lessons for that week. The goal of discussions is for students to interact with each other and to ask and answer questions related to the covered material. Discussion topic tags and titles indicate the associated module and the required status. - I will monitor the discussions frequently to ensure your questions get answered. - I will endorse posts that meet the criteria for credit. - Be kind, supportive, and respectful of your classmates. - Monitor discussions to ensure you acknowledge and respond to feedback. **Undergraduate Students** - Posts must address each of the issues in discussion topic to receive full credit. - Posts must be clearly written and grammatical. -Read over and revise your post to ensure it clearly addresses the relevant points. - Assertions must be reinforced by supporting resources (e.g., a URL link). **Graduate Students** - In addition to the undergraduate requirements, graduate students must provide feedback to at least one of their classmate's required posts. Please try to choose someone who has not yet received feedback so that all participants receive feedback from at least one other person. - Feedback must be grammatical and clearly written. - Assertions must be reinforced by supporting materials (e.g., a URL link is fine). - Graduate students need one endorsed response AND one endorsed feedback per module to receive full credit (5 points) - Posts must be clearly written and grammatical (Read over and revise your post to ensure it clearly addresses the relevant points). - Assertions must be reinforced by supporting resources (e.g., a URL link).
Knowledge quizzes: required for all students 4 quizzes completed by all students	Quizzes 1-3: 10 points each Quiz 4: 20 points Total = 50 points (~13% of grade)	Multiple choice/short answer tests. These quizzes will occur approximately every two weeks. The goal of these quizzes is to solidify knowledge and concepts covered in each section. The Last Quiz 4 will sample topics from the entire course.
Total undergraduate	**380 points**	

Total graduate	**380 points**	

Final Examination or Project

The date and time of the final exam or project, along with a link to the Final Exam Regulations and Final Exam Schedule, https://registrar.arizona.edu/faculty-staff-resources/room-class-scheduling/schedule-classes/final-exams

Grading Scale and Policies

University policy regarding grades and grading systems is available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system.

Course grades will be based on:

- Completion of lessons in OpenClass
- Quizzes
- Discussions

Letter Grade	Points	Percentage
Undergraduate	**380**	
A	342 or higher	90% or better
B	304-341	80%-89.99%
C	266-303	70%-79.99%
D	228-265	60%-69.99%
E	190-227	50%-59.99%
Graduate	**380**	
A	342 or higher	90% or better
B	304-341	80%-89.99%
C	266-303	70%-79.99%
D	228-265	60%-69.99%
E	190-227	50%-59.99%

Incomplete (I) or Withdrawal (W):

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policy, which is available at https://catalog.arizona.edu/policy/courses-credit/grading/grading-system.

Dispute of Grade Policy

The acceptable time period for disputing a grade on a paper, project, or exam is up to one week after the grades are posted on D2L. If you wish to discuss your grade you may email instructor within one week time frame. The whole assignment/test will be regraded. This may result in a higher or a lower grade.

Scheduled Topics and Activities

Class	Topics	Assignments	Grad/Undergrad	Readings
Week 1	**Foundational concepts**			
Lesson 0	Introduction to the course layout	Lesson completed in Open Class	Required for both grad and undergrad	Familiarization with open class layout and D2L

				Ward:Chapter 1 on D2L
Lesson 1	History of neuroimaging	Lesson completed in Open Class	Required for both grad and undergrad	Huettel: Chapter1 introduction to MRI/fMRI posted on D2L Article: Reichle 2008. History of MRI
Lesson 2	General overview of brain anatomy	Application: hands-on Tutorial 1 completed in Open class Lesson completed in Open Class	Required for both grad and undergrad	Ward:Chapter 2 on D2L
Lesson 3	Brain orientation terminology and localization systems MNI coordinates	Application: hands-on Tutorial 2 completed in Open class Lesson completed in Open Class	Required for Both grad and undergrad	D2L: Ward:Chapter 2 on D2L
Lesson 4	Brain Atlases: what are they are why do we need them?	Lesson completed in Open Class	Required for Both grad and undergrad	Readings posted on D2L: requited for graduate students Recommended for undergraduate
		Complete discussion for week 1		
Week 2	**Introduction to MRI physics and principles of signal generation**			
Lesson 5	Working with brain atlases using neuroimaging tools, introduction to visualization tools: MRIcron, MRIcro, SurfIce -examining files and understanding how to view images -identifying Brodmann areas and functional labels	Application: Tutorial 3 Lesson completed in Open Class	Required for Both grad and undergrad	Readings on D2L

Lesson 6	MRI Physics and basic mechanism: Introduction to basics of MRI	Lesson completed in Open class	Required for Both grad and undergrad	Huettel: Chapter3 (Principles of MR Signal Generation)
Lesson 7	Proton Spins in Magnetic Field: Compass Simulator	Applications:Tutorial 4 lesson completed in Open class	**undergraduate students complete lesson** **Graduate students: complete Lesson + Tutorial 4**	Advanced topics: Huettel Chapter 4 (Image Formation) posted on D2L
Lesson 8	Image Acquisition and Timing Parameters (T1 and T2 weighting): MRI signal generation	Lesson completed in Open class	Required for Both grad and undergrad	Advanced topics: Huettel: Chapter5 (MRI contrast) on D2L
		Quiz 1: weeks 1 and 2 **Complete discussion for week 2**		
Week 3	**Magnetic field and MRI**			
Lesson 9	Magnetic Resonance underlying MRI: Bloch Simulator Activity	Application: hands-on Tutorial 5 Lesson completed in Open class	**undergraduate students complete lesson** **Graduate students: complete Lesson + Tutorial 5**	Articles: MRI pulses
Lesson 10	From magnets to MRI scanners	Lesson completed in Open class	Required for Both grad and undergrad	Huettel: Chapter2 MRI Scanners on D2L
Lesson 11	Components of MRI scanners	Lesson completed in Open class	Required for Both grad and undergrad	Huettel: Chapter2 MRI Scanners on D2L
Lesson 12	fMRI signal generation: BOLD response and hemodynamic response function What do we measure with fMRI?	Lesson completed in Open class	Required for Both grad and undergrad	Huettel: Chapter 6 (From neuronal activity to hemodynamic activity) Chapter 7 (BOLD fMRI) Posted on D2L
		Complete discussion for week 3		
Week 4	**Study Design**			

Lesson 13	fMRI safety -safety screening -IRB considerations	Lesson completed in Open class	Required for Both grad and undergrad	Huettel Chapter 2 page 44-55. Materials posted on D2L
Lesson 14	Experimental design -Principles and best practice - setting up experiment at the fMRI facility	Lesson completed in Open class	Required for Both grad and undergrad	Huettel Chapter 11 (design) posted on D2L
Lesson 15	Experimental Design. Components of fMRI experiment and design optimization	Applications Tutorial 6: design optimization software Lesson on Open Class	**Undergraduate students complete lesson** **Graduate students complete Lesson + Tutorial 6**	Readings on D2L Ward Chapter 4
Lesson 16	Introduction to MATLAB and SPM12	Application: Tutorial 7 Lesson on Open Class	Required for Both grad and undergrad	Readings on D2L
		Quiz 2: weeks 3 and 4 **Complete discussion for week 4**		
Week 5	**fMRI data preprocessing**			
Lesson 17	DICOM import in SPM12: converting DICOM format to nifti -examining outputs -Data organization and management	Application: Tutorial 8 Lesson on Open Class	Required for Both grad and undergrad	Readings on D2L
Lesson 18	Advanced data organization Introduction to BIDS data format	Lesson on Open class **Tutorial 9: BIDS data format**	**Undergraduate students complete lesson** **Graduate students complete Lesson + Tutorial 9**	Readings on D2L
Lesson 19	fMRI/MRI data preprocessing pipeline in SPM 12	Lesson on Open class	Required for Both grad and undergrad	

	-temporal and spatial preprocessing steps explained			
Lesson 20	fMRI data preprocessing practicum in SPM 12: building and running preprocessing batch	Application: Tutorial 10 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
		Complete discussion for week 5		
Week 6	**Data modeling and statistical tests**			
Lesson 21	Examining and understanding outputs of preprocessing	Lesson on Open class	Required for Both grad and undergrad	
Lesson 22	fMRI model specification and estimation in SPM 12: Theory and practical applications	Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
Lesson 23	Building model specification batch in SPM 12 -examining inputs and outputs -design matrix	Application: Tutorial 11 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
Lesson 24	Building contrasts at the single subject level in SPM12	Application: Tutorial 12 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
		Complete discussion for week 6		
		Quiz 3: weeks 5 and 6		
Week 7	**Factorial Design and Analysis**			
Lesson 25	Group analysis: Building t-tests at the second level	Application: Tutorial 13 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
Lesson 26	Group analysis: Analysis of Variance (ANOVA) at the second level	Application: Tutorial 14 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L

Lesson 27	Group analysis: defining contrasts at the second level and understanding outputs	Application: Tutorial 15 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
Lesson 28	Visualizing results of fMRI analysis as statistical maps and generating peak activation tables	Application: Tutorial 16 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
		Complete discussion for week 7		
Week 8	**Advanced Topics**			
Lesson 29	Working with xjview and postprocessing of statistical maps	Application: hands-on Tutorial 17 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
Lesson 30	Voxel Based Morphometry	Application: Tutorial 18 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
Lesson 30	Clinical Applications: Lesions and region of interest segmentation using ITK snap.	Application: Tutorial 19 Lesson on Open class	Required for Both grad and undergrad	Readings on D2L
		Complete discussion for week 8		
		Quiz 4: Last quiz includes weeks 1 to 8		

Subject to Change Notice

Information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor of this course.

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

Those who continue to disrupt the class activities may be reported to the Dean of Students.

Notification of Objectionable Materials

This course will contain material of a mature nature, which may include explicit language, depictions of nudity, sexual situations, and/or violence. The instructor will provide advance notice when such materials will be used. Students are not automatically excused from interacting with such materials, but they are encouraged to speak with the instructor to voice concerns and to provide feedback.

Safety on Campus and in the Classroom

For a list of emergency procedures for all types of incidents, please visit the website of the Critical Incident Response Team (CIRT): https://cirt.arizona.edu/case-emergency/overview

Also watch the video available at https://arizona.sabacloud.com/Saba/Web_spf/NA7P1PRD161/common/learningeventdetail/crtfy0000000000003560

Graduate Student Resources

Please consider including a link to the University of Arizona's Basic Needs Resources page: http://basicneeds.arizona.edu/index.html

Additional Resources for Students

UA Academic policies and procedures are available at http://catalog.arizona.edu/policies

Campus Health
http://www.health.arizona.edu/
Campus Health provides quality medical and mental health care services through virtual and in-person care.
Phone: 520-621-9202

Counseling and Psych Services (CAPS)
https://health.arizona.edu/counseling-psych-services
CAPS provides mental health care, including short-term counseling services.
Phone: 520-621-3334

The Dean of Students Office's Student Assistance Program
https://deanofstudents.arizona.edu/support/student-assistance
Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services.
Email: DOS-deanofstudents@arizona.edu
Phone: 520-621-7057

Survivor Advocacy Program
https://survivoradvocacy.arizona.edu/

The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support.
Email: survivoradvocacy@arizona.edu
Phone: 520-621-5767

Confidentiality of Student Records

http://www.registrar.arizona.edu/ferpa

University-wide Policies link

Links to the following UA policies are provided here, http://catalog.arizona.edu/syllabus-policies: Absence and Class Participation Policies

- Threatening Behavior Policy
- Accessibility and Accommodations Policy
- Code of Academic Integrity
- Nondiscrimination and Anti-Harassment Policy
- Subject to Change Statement

Resources

- **Google** and **OpenClass** make every effort to ensure their tools are accessible. Consult the following documents that describe those accessibility statements:
- Google Docs Accessibility Statement
- OpenClass Accessibility Statement

Course Technology Resources

- We will use several software and online tools during this course. The following sites provide key information about these tools:
- OpenClass YouTube videos OpenClass is the primary tool you will use for your assignments. If you'd like to learn more about OpenClass features, this is a nice YouTube channel providing more information.
- OpenClass Site D2L will have links to your OpenClass lessons directly. However, if you want to check out the main site, this is it.
- The main software used in this class will be SPM12: https://www.fil.ion.ucl.ac.uk/spm/
- You will need to install MATLAB to run SPM12. MATLAB is free for the UofA students and it can be downloaded from here: https://www.mathworks.com/academia/tah-portal/university-of-arizona-30356115.html#new
- You will also learn how to work with visualization software including:
    - MRIcron: https://people.cas.sc.edu/rorden/mricron/install.html
    - MRIcro: https://people.cas.sc.edu/rorden/mricro/
    - SurfIce: https://www.nitrc.org/projects/surfice/
    - Xjview: https://www.alivelearn.net/xjview/
    - ITKSNAP: http://www.itksnap.org/pmwiki/pmwiki.php

Technical Support

- UCATT: https://studenthelp.intech.arizona.edu/ Support related to classes, D2L and other learning tools
- UITS: https://it.arizona.edu/get-support (626-TECH) General technical support

THE UNIVERSITY OF ARIZONA

Tentative Syllabus

Fall 2024, COGS 509/CGSC 409
Computing for Neuroimagers, 3 credits i-Course

Instructor Information

Dianne Patterson, Ph.D.
dkp@arizona.edu (preferred contact method)
Office: BSRL, Room 235
RII Neuroimaging Staff Scientist
Phone: 520-621-8380 (Cognitive Science main number)
Program Coordinator Neuroimaging Methods Certificate

I grew up in Arizona but lived in Peru, Venezuela, and Mexico. I am married and have a grown son and grandson.

I earned a B.A. in Philosophy and M.A. in English from ASU, then an M.A. in Linguistics and Ph.D. in Psychology at the U of A. I worked with Irene Pepperberg and Alex the parrot and imaged the parrot's vocal mechanisms.

My experience imaging the parrot vocal tract later led me to work in neuroimaging, especially fMRI, and dMRI. I am especially interested in emerging standards, such as the Brain Imaging Data Structure (BIDS).

Course Communication

OpenClass Discussions: I prefer that communication be posted in the OpenClass Discussion so that everyone benefits. You can post anonymously to the OpenClass discussion if you are more comfortable that way.

- I monitor the OpenClass discussions daily. If you have a discussion question specifically for me, tag it with "prof", and I'll get to it soon. Otherwise, I want to ensure your classmates have an opportunity to provide feedback (so I'll hold off).

- I will post **announcements** to the OpenClass discussion to share information with the whole class.

Email: I'm always available by email (dkp@arizona.edu) and typically respond the same day. If the topic is personal, then email is the way to go.

Office Hours: By appt: I am happy to jump on Zoom and meet with you most days in the late morning or afternoon. This can be especially helpful if you are struggling with software, or want feedback on an idea for the final project. Email me and we'll set it up.

Course Description

This course introduces students to best practices for processing neuroimaging data with a focus on data organization and campus computing resources. We begin with software and account setup, and a discussion of neuroimaging data. Subsequently, we explore issues of data sharing and reproducibility, emphasizing the BIDS standard for naming and organizing neuroimaging data, and the process of converting DICOM data into BIDS-compliant datasets.

Before introducing individual data processing pipelines, you spend time learning about the HPC (High-Performance Computing Cluster): especially the job submission system (SLURM), and Globus for effective data transfer. You will use containerized applications to process data: DICOM conversion tools, anonymization software, quality assessment tools (e.g. MRIQC), fMRI preprocessing (fmriprep), and dMRI preprocessing tools (QSIprep).

Teaching Methods and Learning Processes

The course is implemented in OpenClass, an online learning tool that organizes assignments into lessons, quizzes and reviews complemented by flashcards and a discussion forum. OpenClass sends you a weekly learner digest email of your progress. The digest summarizes your progress and indicates incomplete assignments and missed questions. Reviews and discussions give you the opportunity to share thoughtful responses with your classmates and me.

In addition to OpenClass, Google docs and Google Cloud Shell and the High-Performance Computing Cluster, but you will need to install some software (e.g., Globus). You may use Apporto Virtual machines. Most software will be available through Google Cloud shell and or the High-Performance Computing Cluster, but you will need to install some software (e.g., Globus).

Links are in the Course Technology Resources at the end of the syllabus.

The class also includes a final project which gives you the opportunity to explore a software tool in greater depth.

Course Prerequisites

- COGS 500 or CGSC 400: Computing for the Research Lab
- You will need sponsorship for an HPC account! Confirm that your advisor/PI is comfortable providing such support. In the event that you cannot find HPC sponsorship, contact me (dkp@arizona.edu) to discuss support options.

Course Objectives

- To introduce current best practices for processing and curating MRI research data using the BIDS standard
- To provide practical experience using High-Performance Computing (HPC) resources

- To provide specific experience with several standard containerized BIDS apps: Heudivonv, Bidsonym, MRIQC, fMRIPrep, and QSIprep
- To provide theoretical motivation for, and practical experience with, multivariate ICA analysis of fMRI data using the GIFT package.
- To introduce and motivate image formats commonly used in MRI research, including volumetric and surface-based formats, and to discuss their internal structure and uses.

Expected Learning Outcomes for Undergraduate Students

- You will be able to describe several types of MRI scans.
- You will be able to compare several image formats.
- You will be able to explain why the BIDS standard is useful.
- You will be able to convert DICOM data into BIDS.
- You will be able to describe the importance of susceptibility distortion correction
- You will be able to describe the issues surrounding anonymization of neuroimaging data
- You will be able to operate the High-Performance Computing Resources to transfer data, submit batch jobs, and work with Singularity/Apptainer containers.
- You will be able to explain the importance of Neuroimaging repositories
- You will be able to describe the importance of quality assessment for MRI images
- You will be able to implement automated quality assessment of BIDS data with MRIQC
- You will be able to explain the features of fMRI data and the goals of preprocessing fMRI
- You will be able to compare classic DTI with modern dMRI.
- You will be able to employ BIDS apps to do defacing, quality assessment, fMRI preprocessing, and dMRI preprocessing.

Expected Learning Outcomes for Graduate Students

- You will be able to describe several types of MRI scans.
- You will be able to compare several image formats.
- You will be able to explain why the BIDS standard is useful.
- You will be able to convert DICOM data into BIDS.
- You will be able to describe the importance of susceptibility distortion correction
- You will be able to describe the issues surrounding anonymization of neuroimaging data
- You will be able to operate the High-Performance Computing Resources to transfer data, submit batch jobs, and work with Singularity/Apptainer containers.
- You will be able to explain the importance of Neuroimaging repositories
- You will be able to describe the importance of quality assessment for MRI images
- You will be able to implement automated quality assessment of BIDS data with MRIQC
- You will be able to explain the features of fMRI data and the goals of preprocessing fMRI
- You will be able to explain important approaches to fMRI analysis
- You will be able to compare classic DTI with modern dMRI.
- You will be able to employ BIDS apps to do defacing, quality assessment, fMRI preprocessing, and dMRI preprocessing.

Required Text

Jenkinson, M. & Chappel, M. (2018) Introduction to Neuroimaging Analysis (also available on Amazon as paperback or ebook)

Required Software

Set up an HPC account by following the HPC account instructions!

After being notified that your account has been created, log in to the HPC portal to ensure you have permission and your group is listed. **Don't leave this till the last minute!** Take the time NOW to ensure you have sponsorship from your advisor! Inform me immediately if you have any problems.

Install the following cross-platform software programs:

Mango A small cross-platform viewer for NIfTI and DICOM images

Globus: A speedy file transfer program used for the HPC

- Globus: Windows Instructions
- Globus: Mac instructions
- Globus: Linux instructions

dcm2niix This converts DICOM data to NIfTI data and should work on all operating systems

Schedule of Topics and Activities

The class covers 10 broad topics

MRI Scans

Goals:
This module ensures you are familiar with the types of MRI scans commonly used in neuroimaging research (structural, field maps, fMRI and dMRI). These scan types will come up in subsequent lessons where you learn more about how to understand and process them.

Module Description:
I provide an overview of MRI scan types, scan protocols (these are PDF documents, e.g. CARE_new_sequences.pdf), and the DICOM image format. There is a lot of important information in the protocols and the DICOM image header, so I want you to know how to find that information. Usually, you'll do very little with DICOMS except convert them to NIfTI, preferably using the BIDS standard.

Learning Objectives:
You will be able to describe several types of MRI scans.

- Explain the features and importance of structural scans
- Explaining the features and importance of 4D scans
- Explain the features and importance of field maps
- Describe image fundamentals for MRI scans
- Explain what an MRI protocol is and how it is useful.
- Describe the DICOM image format.
- Manipulate the DICOM image format.

BIDS and JSON

Goals:
This module explains the benefits of BIDS and provides practice converting DICOM data to BIDS using different tools. This will prepare you for the rest of the class where processing is done on BIDS datasets.

Module Description:
BIDS (Brain Imaging Data Structure) is a best practice convention for naming and organizing your NIfTI data. I explain why you should care about BIDS, and what you need to learn to take advantage of the rich BIDS infrastructure for organizing neuroimaging data. Crucially, you need to convert your DICOM data, so I introduce you to current options including dcm2niix, ezBIDS, BIDScoin, and Heudiconv. You'll get practice with three of these: dcm2niix, ezBIDS and Heudiconv. You will explore the resulting data structure and naming conventions so you are aware of issues impacting the creation of a BIDS-compliant dataset. BIDS also requires that each NIfTI image be accompanied by a JSON (Javascript Object Notation) sidecar file that contains related metadata, so you will spend time learning to understand and manipulate the structure and contents of those JSON files.

Learning Objectives:
Explain the purpose and implementation of the BIDS standard

- Explain the purpose of the BIDS standard
- Describe the BIDS specification
- Convert DICOM data into BIDS
- Describe the implementation of DICOM to BIDS conversion
- Describe the role of dcm2niix
- Manipulate data with dcm2niix

- Describe the ezBIDS converter
- Manipulate data with ezBIDS
- Describe the features of heudiconv
- Manipulate data with heudiconv
- Describe the role of JSON files in the BIDS specification
- Describe tools for working with JSON files
- Manipulate JSON files

SDC

Goals:
This module will help you integrate knowledge about MRI scans and BIDS to solve an important problem with EPI (echoplanar) images. EPI images (dMRI, fMRI, and ASL) are especially important because they are both susceptible to distortion and are often central to our neuroimaging projects.

Module Description:
This module describes (1) the distortion problem in EPI MRI scans, (2) the field map and/or pepolar images to correct those distortions, and (3) how BIDS apps require special information to implement the distortion corrections.
The module provides practice editing the JSON sidecars to provide the special information some BIDS apps require.

Learning Objectives:
You will be able to describe the importance of susceptibility distortion correction

- Describe the problem of susceptibility distortion
- Describe approaches to susceptibility distortion correction
- Describe susceptibility distortion correction for dMRI images
- Describe susceptibility distortion correction for fMRI images
- Describe susceptibility distortion correction for ASL images
- Describe susceptibility distortion correction with BIDS

Anonymization

Goals:
This module will help you to understand the requirements and challenges associated with deidentifying MRI scan data. Such deidentification is a prerequisite to processing data on the HPC or sharing it on public repositories.

Module Description:
To meet HIPAA requirements, you must anonymize your imaging data. Usually, this involves conversion from DICOM to BIDS and defacing. Defacing is the process of obscuring facial features in scans so that they cannot be matched to photographs. BIDSonym is a nice defacing and anonymization tool that might make a good addition to your pipeline (unless you've accomplished defacing another way, e.g., EZ-BIDS). It is also possible to make DICOMS HIPAA-compliant, and I provide references, but you rarely have to do this. There are issues with defacing, including possible consequences for analysis, but we won't dig deeply into these.

Learning Objectives:
You will be able to describe the issues surrounding anonymization of neuroimaging data

- Explain how anonymization impacts metadata
- Describe defacing and the associated issues
- Describe BIDSonym defacing options
- Apply BIDSonym defacing options

High Performance Computing

Goals:
You need to know how to take advantage of this system so your lab computers are not bogged down for weeks at a time running processing steps. It is a huge computing resource and you get lots of time on it for free. Once you know how to use the U of A HPC, you'll be well-positioned to take advantage of other HPCs around the world.

Module Description:
You'll do a lot of work on the HPC from here on out. You'll learn to sign up for an account, use the OOD graphical interface, transfer data, submit batch jobs, use apptainer, invoke modules, and use the interactive desktop.

Learning Objectives:
You will be able to operate the High-Performance Computing Resources to transfer data, submit batch jobs, and work with Singularity/Apptainer containers.

- Explain the HPC infrastructure
- Describe HPC GUI tools
- Describe Bash configuration for neuroimaging on the HPC
- Describe data transfer options for the HPC
- Practice data transfer for the HPC
- Describe HPC SLURM batch jobs
- Describe HPC SLURM batch array jobs
- Implement an HPC SLURM batch job
- Implement an HPC SLURM batch array job
- Explain why we use apptainer on the HPC

Neuroimaging Repositories

Goals:
This module will alert you of the rich repositories of neuroimaging data that are freely available to you to download and process.

Module Description:
The module introduces three repositories: OpenNeuro, TemplateFlow, and the Human Connectome Project. Each has different goals and benefits. The first two are easily accessible with Datalad, and you will practice such access.

Learning Objectives:
You will be able to explain the importance of neuroimaging repositories

- Explore the OpenNeuro Repository and describe its importance
- Explore the TemplateFlow Repository and describe its importance
- Explore the Human Connectome Project Repository and describe its importance
- Explain how to invoke Datalad on the HPC
- Explain the purpose of an HPC module
- Download data from a Neuroimaging repository with Datalad
- Describe the objectives of the Datalad project

Quality Assessment

Goals:
This module describes the importance of evaluating the quality of your neuroimaging data, and teaches you how to identify problems.

Module Description:
You'll work with MRIQC for quality assessment of fMRI and structural data. You'll get practical experience running MRIQC on the HPC, and learn what the output metrics can tell you (and what they can't).

Learning Objectives:
You will be able to implement automated quality assessment of BIDS data with MRIQC

- Implement processing with MRIQC
- Explain the output of MRIQC
- You will be able to describe the importance of quality assessment for MRI images
- Explore the MRIQC Output

fMRI Preprocessing

Goals:
Because fMRI is the most common focus of research MRI, you will learn how and why to preprocess fMRI data using the fMRIPrep BIDS app. fMRI preprocessing is a necessary prerequisite to fMRI analysis.

Module Description:
Most of you will want to process fMRI data. fMRI (functional MRI) measures changes in blood oxygen levels to identify active regions in the brain. I'll teach you to preprocess fMRI data using fMRIPrep. COGS 505 goes much more deeply into fMRI processing and experimental design.
fMRIPrep is the gold standard for fMRI preprocessing. I'll describe how to run the BIDS app, the available options, and how to interpret the results.
As a result of the Human Connectome Project, new image formats, GIFTI and CIFTI have emerged. I introduce these formats so you know why they are important and that they will become increasingly important. fMRIprep can readily generate these image formats for you, but related analysis tools are not ubiquitous (most tools still work on volumetric data --e.g., NIfTI).

Learning Objectives:
You will be able to explain the features of fMRI data and the goals of preprocessing fMRI

- Implement processing with fMRIprep
- Explain the factors involved in fMRIprep setup
- Explain how to interpret fMRIprep output
- Compare surface and volumetric image formats
- Describe the features of surface image formats
- Describe the features of volumetric image formats
- Compare the CIFTI and GIFTI surface formats

fMRI Analysis

Goals:
After preprocessing fMRI data, you still need to analyze it. The goal of this module is to compare common approaches to fMRI analysis and to teach you to implement an ICA analysis in GIFT.

Module Description:
This module compares fMRI analysis approaches: GLM and ICA. The module then digs more deeply into packages available for ICA analysis, ICA algorithms, stability analysis, and functional connectivity. You will practice running an ICA analysis using GIFT and Matlab on the HPC. Finally, you'll get a brief introduction to working in standard space and understanding atlases.

Learning Objectives:
You will be able to explain important approaches to fMRI analysis

- Describe the classic GLM approach to fMRI analysis
- Compare GLM to ICA for fMRI analysis
- Explain why multivariate ICA analysis of fMRI data is advantageous
- Describe the ICA approach to fMRI analysis
- Explain the problems with the canonical HRF
- Describe the classic correlational approach to resting state fMRI analysis
- Compare ICA analysis packages
- Describe the pros and cons of Melodic
- Describe the pros and cons of GIFT
- Describe the pros and cons of CONN
- Categorize ICA algorithms
- Describe ICA stability analysis
- Compare dynamic and static functional network connectivity
- Process a dataset using GIFT
- Describe the importance of atlases and standard space
- Describe the goals and implementation of the roixtractor tool
- Generate analyses with roixtractor

dMRI

Goals:
dMRI is the second most common focus of research MRI. The goal of this module is to explain what dMRI is for and how it is processed.

Module Description:
Many of you will also process dMRI (a.k.a diffusion MRI, DWI, or DTI) data. dMRI measures properties of white matter fibers. These properties change in response to learning, though these changes are slow (i.e., on the order of weeks) compared to fMRI. You will learn about both classic DTI and modern dMRI; and you will practice preprocessing and reconstruction of dMRI data using the QSIprep BIDS app.

Learning Objectives:
You will be able to compare classic DTI with modern dMRI

- Implement processing with qsiprep
- Describe the features of classic DTI
- Describe approaches to tractography
- Describe the features of modern dMRI
- Describe approaches to dMRI reconstruction
- Describe the features of qsiprep
- Implement reconstruction with qsiprep
- Explain how to interpret qsiprep output

Assessments

Weekly Modules: 630 pts (~86% of your grade)

The bulk of your grade is based on completing lessons, practices, reviews, quizzes, and discussions in OpenClass. Assignments will be due twice weekly by 9 pm Mountain standard time. OpenClass will track your completion. You can work ahead, but you do have to complete some assignments before going on to others. The workload is about 6-8 hours per week, with some variation by week. Most assignments are graded based on your mastery of the material. Partial credit will

be awarded for late work: 90% for submissions within 24 hours; 80% for submissions within 48 hours; 50% for submissions later than 48 hours. Assignments are graded automatically, but synchronized manually with D2L. I'll do this synchronization at least once a week. If you find you are a week behind, I urge you to drop the class! If you join the class after the start date, I expect you to catch up in the first week.

Discussions: 50 pts (required discussions=30 pts; encouraged discussion=20 pts; ~7% of your grade)

Goal: Discussion is implemented in OpenClass. Discussion provides you with the opportunity to meet your classmates, go beyond the lessons by finding useful resources, and follow up on your own questions or those of others. Discussion topic tags and titles indicate the associated module and the "required" status. At the end of each lesson, you'll find links to the relevant discussion.

Be kind, supportive, and respectful to your classmates. I reserve the right to remove discussion posts that are offensive or disrespectful. You can and should report any post you find problematic to me.

- I will monitor the discussions frequently to ensure your posts get responses.
- I will endorse posts that meet the criteria for credit (see rubric below).
- You should monitor discussions to ensure you acknowledge and respond to feedback, and that you see announcements.
- Questions are welcomed in the discussion at any time, and you may post anonymously if desired.

Posts are of several types:

- Required discussion
- Encouraged discussion
- Required Reading questions (Not counted toward discussion grade)
- Announcements (I may make periodic announcements). Feedback is welcome for these as well.
- Feedback is welcome for these as well.
- Questions: You can generate a question at any time and add tags to it: Do this if you want a direct response from me.

All feedback and required and encouraged **discussion** posts contribute to the discussion grade!
(Required reading posts count toward the lesson grade, not the discussion)

If you want immediate* direct feedback from me, create a **question**. I'll filter discussions to look for questions.
See OpenClass Discussion Editor User Manual for instructions on creating a question.
*"Immediate" will usually be within 24 hours. You can always **email me if you prefer**.

For all other discussions, I want to give your classmates a couple of days to provide feedback before I jump in.

Grading Rubric for Discussion Posts

To receive credit, I must endorse your post.

Endorsed posts will need the following features:
- Posts must be clearly written and grammatical (Read over and revise your post to ensure it makes sense and clearly addresses the relevant points). If I don't understand your post, I won't endorse it.
- Posts must be substantive. That is, you should engage and have something to say. You can expect posts should be at least a couple of sentences ("I don't know" or "NA" are not substantive).

- Posts must provide links to support your assertions or share your discoveries (unless you are just sharing an experience)

Feedback will be evaluated like posts, but here is some additional guidance:

- Please try to **choose someone who has not yet received feedback** so that all participants receive feedback from at least one other person.
- **If the post is a question**, feedback should attempt to answer the question (with relevant links if possible).
- **If the post shares a resource**, feedback should include looking at the resource and sharing your own view of it, e.g., how is it interesting or valuable? Does it inspire you to share another related resource (If so, please share that).
- **If the post shares an opinion or experience**, feedback should consider it thoughtfully and share your response, e.g., Have you had a similar experience? Does the post help you think in new ways, or realize something you hadn't thought about? Remember, keep feedback positive and encouraging.

Required Discussions

- Everyone must respond to the required discussion topics.
- For each required question, graduate students must also provide feedback to a classmate to be endorsed.
- Required discussion topics (30 pts: 15@2 pts each).

Encouraged Discussions

- The remaining 20 points of discussion will be awarded for posts to "encouraged" discussion topics or thoughtful feedback to your classmates

Required Reading Questions

- First, they are identified as questions rather than discussions.
- Second, they must be completed to earn full credit for each reading assignment, rather than contributing to the discussion grade. This is because there is nothing to the Required reading lessons EXCEPT these discussion sections!
- The reason for sharing these questions in the discussion forum is so you may benefit from each others' insights about the readings.

Undergraduate

- Respond to all required discussion topics.
- The remaining 20 points of discussion will be awarded for posts to "encouraged" discussion topics or feedback to your classmates. You will be awarded 1 pt for each such endorsed post (20 pts: 20 posts @1 pt).

Graduate

- Respond to all required discussion topics.
- The remaining 20 points of discussion will be awarded for posts to "encouraged" discussion topics or feedback to your classmates. You will be awarded 0.5 pts for each such endorsed post (20 pts: 40 posts @0.5 pt).

Final Project: 50 pts total (proposal=5 pts, project document=45 pts; ~7% of your grade)

All students must complete a final project. The project is an opportunity for you to take a deeper dive into a software topic discussed in class. This consists of a 5-point double-spaced 1-2-page proposal (which must be accepted by the instructor),

and a 45-point project due on the last day of class as per the Final Exam Schedule. The proposal and project document must be submitted on D2L.

Goal: Research is about evaluating new tools and ideas! Being self-reliant will make you invaluable in a lab setting, because your supervisors will know they can give you a project and you will follow through, make good judgements and document what you do and why. The goal of this project is to empower you to take the lead and solve problems.

Learning Objectives: This project gives you the opportunity to apply skills, tools, and knowledge from this class to take a deeper dive into a related software topic:

- Determine your requirements so you can examine and select software you believe will address those requirements, and identify resources that help in that investigation.
- Determine how to evaluate that software, and then execute your evaluation plan.
- Compile information from your evaluation to determine whether the software suits your needs and why.

Undergraduate

Undergraduate projects should be about 5-pages, double-spaced.

Graduate

The project is held to a higher standard for graduate students and should be about 10 pages, double-spaced.

Proposal: Grading Rubric

The project will not be accepted unless you turn in a proposal and have it accepted first! The 1-2 page proposal should explain why you are interested in this particular topic and identify relevant resources. Feel free to meet with me or email me to discuss and clarify. The proposal will be graded based on the following rubric. In each case, the criterion is met or unmet.

- (1 pt) What software do you want to learn about? Provide a name, link, and description.
- (1 pt) What do you want to accomplish with this software? (i.e., Complete a tutorial? Solve a particular problem? Process particular data?)
- (1 pt) How does this software project align with the goals and topics of the class? (You do not need to use a tool you learned in the class, but you should work with something related to the class topics. Example topics are provided in the list below. Email me or message me in the discussion if you want to explore options).
- (1 pt) How does this software project align with your research interests? (The topic you choose should be relevant to your research interests and enhance your skill set / knowledge. This might be a software tool used in your current lab (if you have one), or a software tool you estimate would enhance your profile for prospective labs.
- (1 pt) You must include a resources section! This is different from a References Section! List websites, articles, or people that might help you accomplish your learning goals. List at least three resources and provide a sentence or two for each of them explaining why the resource might be valuable. Provide links to websites or articles and contact information (e.g., email) for any people.

Late policy: You will lose 1 point for each day your proposal is late.

Project Document: Grading Rubric

The project should report your personal journey learning and evaluating the software.

- (5 pts) Introduction Revise and expand on the proposal: Because you've learned more about the software, you have likely changed your view of (a) what you could accomplish with it, (b) how it aligns with the goals and topics of the class, and (c) how it aligns with your research interests.
- (15 pts) Analysis Describe your personal journey learning the software and using its documentation. I want to see evidence that you were persistent and you experimented. Describe the steps you went through as you worked with the software. Include (a) your difficulties, and their resolution (if any); (b) your successes, and (c) tips for others (or your future self).
- (15 pts) Evaluation Evaluate the software: (a) How was it useful? (b) How was it problematic or disappointing? (c) What are your next steps (e.g., abandon this software in favor of an alternative; revise your expectations about what you can realistically manage; revise your expectations about what the software can do; continue to invest time in learning the software, etc.)
- (10 pts) Resources List websites, articles, or people that help you accomplish your learning goals and/or that would be useful in the future. List at least five resources and provide a sentence or two for each of them explaining why the resource is (or is not) valuable to you. Provide links to websites or articles and contact information (e.g., email) for any people. This should be similar to the Resources section in the proposal, but because you've learned more about the software, you have likely changed your view about what resources actually helped, and you may have found additional resources.

Late policy: You will lose 1 point for each day your project is late.

Examples Project Topics and Resources

- Process your own data if you have some, or download data from an online repository. This would allow you to go through the pipeline of tools you might use for your own study.
- Each of the main apps you will run (MRIQC, fMRIprep, GIFT, and QSIprep) has many options and rich results. Develop a deeper understanding of the flags, options, and/or interpretation of these results. For example, fMRIprep has a wealth of flags to explore and complex output to interpret. Learn more about those options or outputs and discuss why they are important or interesting to you and compare different processing options.
- There are many BIDS apps that are not covered here. Find one that interests you and try it out.

What NOT to Do

- Don't provide a tutorial on SPM. That is covered in detail in COGS 505.
- Don't just copy information from the lessons or websites.
- Don’t be vague. The goal is to work with different data than you used in class, or dig more deeply into one of the tools covered in class, or explore another BIDS app that interests you. I want to see evidence that you grappled with the details of using the tool.
- Do NOT just replicate the material from the class.

Please email me or talk to me about any other topics you are considering! These are only examples and you may be interested in other software that is relevant to your research. Let me know what you are thinking because it is important that the project is interesting and relevant to you.

Grading Scale and Policies

A 90-100% (657-730 pts)
B 80-89% (583-656 pts)
C 70-79% (509-582 pts)
D 60-69% (435-508 pts)
E 0-59% (Failing Grade)

Resources

Learning / Accessibility Resources

The **University of Arizona** provides support for learners in many ways. Here are some of the most relevant:
Data Science Institute provides training workshops in computational and data science skills, and opportunities to become a data science ambassador
Disability Resource Center provides accommodations
HPC Workshops Free workshops offered by our High Performance Computing staff
SALT Center Supports students with learning and attention challenge, provides tutoring
Student Assistance and Advocacy is a central support hub for all students at our university, aiming to assist with various challenges including personal crises, life traumas, health issues, and academic struggles
Student Resources supports the success of undergraduate students through individualized academic support, academic skill building, tutoring, peer mentoring, and creating community using strengths-based programming, evidence-based practices, and robust assessment.
Think Tank and University Tutoring Academic support services in person and online
U of A Accessibility email: accessibilty@arizona.edu

Google and **OpenClass** make every effort to ensure their tools are accessible. Consult the following documents that describe those accessibility statements:
Google Docs Accessibility Statement
Google Cloud Shell Accessibility Statement
OpenClass Accessibility Statement

Course Technology Resources

We will use several online tools during this course. The following sites provide key information about these tools:
Apporto How To We may use Apporto. Apporto is a service providing online virtual machines through the University of Arizona. Apporto will allow you to to use a dedicated Neuroimaging Linux machine with Docker and Neurodesk installed in exactly the same environment as your classmates.
Google Cloud Shell Practicum Google Cloud Shell is a free Unix terminal where you can practice using Unix, GIT and Docker.
High Performance Computing Confluence Pages The University of Arizona High Performance Computing Cluster will be an important focus of the class.
OpenClass YouTube videos OpenClass is the primary tool you will use for your assignments. If you'd like to learn more about OpenClass features, this is a nice YouTube channel providing more information.
OpenClass Site D2L will have links to your OpenClass lessons directly. However, if you want to check out the main site, this is it.
OpenClass Discussion Editor Manual You can just type text in the discussion, but, if you want, you can format and color the text, insert tables, links and info panels. This is a Google Doc that explains how to use the editor in the Discussion sections to do some rich formatting.

Technical Support

UCATT: https://studenthelp.intech.arizona.edu/ Support related to classes, D2L and other learning tools
UITS: https://it.arizona.edu/get-support (626-TECH) General technical support

U of A Syllabus Policies

Final Exam Regulations

Syllabus Policies | Academic Affairs

Syllabus Policies

catalog.arizona.edu/syllabus-policies

Schedule Fall 2024 7.5 week session 2

Week	Start Date	Topics
1	Oct 20 (Start date is actually Th Oct 17)	MRI Scans
2	Oct 27	BIDS, DICOM2BIDS conversion
3	Nov 3	JSON files, SDC (Susceptibility Distortion Correction), Anonymization
4	Nov 10	HPC (High Performance Computing), Neuroimaging Repositories
5	Nov 17	DataLad; Quality Assessment
6	Nov 24	fMRIprep, fMRI, Image Formats
7	Dec 1	fMRI Analysis, Atlases and ROIs, dMRI
8	Dec 8	dMRI
9	Dec 15 (finals end Dec 19)	Work on Projects

Proposal Due: Nov 19
Project Document Due: Dec 11 (last day of classes)

CGSC 410
Visual Cognitive Neuroscience and Models
University of Arizona
UA Online

Course Instructor:
Sarah Cook, PhD
PAS 556
sarahcook@email.arizona.ed

Office Hours (through zoom):
available by appointment
Email response time will be within 24 hours

Graduate Teaching Assistant:
(Name)
(Office Location)
(Email)

(Office Hours)

Course Overview:

How does the brain convert light waves hitting the retina into the visual world we perceive every day? What are the different neural mechanisms used to achieve these aspects of visual processing, and how can we model them using computational modeling? This course will cover the various neural correlates of visual cognition, and the computational models used to describe how we perceive the visual world around us.

Course Objectives:

This course will cover the following topics:

1. Principles of Computational Modeling
2. Neural and Computational Mechanisms of Attention, Object Recognition, and Visual Search
3. The Pupil as a marker of cognitive processes
4. Social Saliency in Visual Attention
5. Visual Illusions and Visual Disorders
6. The Influence of Neuroscience on Robotic Vision

Expected Learning Outcomes:

Upon the completion of this course, students should be able to….

1. ***Interpret*** the results of scientific literature exploring the behavioral paradigms and neural correlates of visual cognition
2. ***Describe*** the neural mechanisms corresponding to visual attention, object recognition, and visual search
3. ***Describe*** how the pupil can be a marker of cognitive processing
4. ***Illustrate*** the mechanisms of various computational models of vision

5. ***Implement*** a computational model of vision using MATLAB

Course Materials:

Zhao, & Zhao, Qi. (2017). *Computational and Cognitive Neuroscience of Vision* (1st ed. 2017.).

Students will have free access to this textbook using the University of Arizona library.

Classroom Format:

This is a 100% online and asynchronous course, meaning that there will be no regularly scheduled meeting times. Students will follow a course calendar, outlining all of the scheduled activities and assignments students should complete each week throughout the semester. The D2L course management system will be used to conduct the course. I will provide regular reminders through email and announcements on the D2L course site, but it is ultimately the responsibility of the student to progress through the course and complete all assignments by the required deadlines. **To participate in this fully online course, students must have daily, reliable access to D2L.**

Grading:

1. Quizzes (7 @ 15 points each, worth up to 105 points)

These quizzes will test and provide feedback on your basic understanding of the course material. The quizzes will be randomized and pulled from a bank of multiple-choice questions, and you will be able to retake the quizzes as many times as you would like up until the completion deadline. Only the highest score will be counted towards your final grade. These quizzes will provide you with low stakes opportunities to test your knowledge and readiness for the upcoming exams. Completion deadlines for the quizzes can be found in the course assignments calendar on d2l. Links for each quiz can be found inside the associated module in D2L, or under the "Quizzes" tab in D2L.

2. Discussions (7 @ 20 points each, worth up to 140 points)

You will have a total of 10 discussion prompts to be completed through the course of the semester. Each discussion will ask you to apply the knowledge that you've learned and engage actively with the course material. You should reply to at least one of your classmate's posts as a part of each discussion. Completion dates can be found in the course assignments calendar on D2L. Links for the discussions can be found in the associated module in D2L, or in the "Discussion" tab in D2L.

3. Exams (3 @ 100 points each, worth up to 300 points)

There will be three required exams, to be completed independently. While you will have access to your notes and course materials, I strongly suggest that you prepare for the exams as if they are closed book. You will only have 60 minutes to complete each exam, and you will not have enough time to look up every answer. Exams will consist of a mix of multiple choice and short

answer questions. You will have a completion window for each exam, which can be found in the course assignments calendar on d2l. Links for each Exam can be found inside the associated module in D2L, or under the "Quizzes" tab in D2L.

4. Modeling Project (3 mini assignments @ 75 points each, worth up to 225 points)

You will complete a modeling project, broken down into three mini assignments through the course of the semester. Completion dates can be found in the course assignments calendar on D2L. Instructions for each mini assignment will be available in the associated module in D2L or can be found under the "Assignments" tab in D2L.

Letter Grade Distribution:

770 – 693 points	A	90 - 100%
692 – 616 points	B	80 - 89.9%
615 – 539 points	C	70 - 79.9%
538 – 462 points	D	60 - 69.9%
461 – 0 points	E	Below 60%

Course Calendar:

Week	Dates	Topic	Readings	Assignments
1		Course Introduction	Textbook Chapters 2, 4	Quiz 1 Discussion 1
2		Object Recognition	Textbook Chapter 3, 5	Quiz 2 Discussion 2
3		Review for Exam 1 Pupillometry	Textbook Chapter 7	Quiz 3 Discussion 3 Exam 1
4		Visual Search Social Saliency	Textbook Chapters 6, 8	Quiz 4 Discussion 4 Mini Assignment 1
5		Modeling Attention Review for Exam 2	Textbook Chapter 12	Quiz 5 Discussion 5 Exam 2
6		Visual Illusions Visual Disorders	Textbook Chapters 10, 13	Quiz 6 Discussion 6 Mini Assignment 2
7		Memory and Vision Neuroscience and Robotics	Textbook Chapters 9, 11	Quiz 7 Discussion 7
8		Review for Final Exam		Exam 3 Mini Assignment 3

Course Policies:

Classroom behavior policy: This is a fully remote, 100% online course, which includes communication with instructors and peers through email, discussion forums, and web conferencing. Students are expected to act in a respectful and professional manner. The presentation of differing views and perspectives as they relate to course content is encouraged but must be done in a respectful manner. Any disparagement of others' views is unacceptable. All written communication should be checked for spelling and grammar. See the following for more information: https://deanofstudents.arizona.edu/disruptive-behavior

Threatening behavior:
The University seeks to promote a safe environment where students and employees may participate in the educational process without compromising their health, safety or welfare. The Arizona Board of Regents' Student Code of Conduct, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self. Threatening behavior can harm and disrupt the University, its community and its families. Please see the following document for more information:
http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students

Academic Integrity: The University student code of Academic Integrity prohibits plagiarism in any and all class assignments and activities in this course. Please see the following document for more information: https://deanofstudents.arizona.edu/policies/code-academic-integrity

Nondiscrimination and Anti-Harassment policy: Our online classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others. The University is committed to creating and maintaining an environment free of discrimination; see
http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

Absence and Class Participation Policy: Because this is an online course, absence and class participation will be assessed through the completion of required course assignments. Participation in the course is assessed through the completion of the discussions, where you will interact with your classmates in discussion of course material.

Accessibility and Accommodations:
It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268, email: uadrc@email.arizona.edu , http://drc.arizona.edu/) to establish reasonable accommodations.

Subject to Change Statement:
Information contained in the course syllabus, other than the grade policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor. If any changes

are made, they will be provided immediately in writing to students via posting to the D2L course website.

Grade appeals:
If you would like to appeal a grade for an exam or assignment, you should do so **within 3 days** from the day the grade was returned to you. Any appeal that does not come within 3 days will not be considered. If you make an appeal, you should state either (a) why you believe your exam or assignment was incorrectly scored, or (b) why you believe your answer to a particular question or item is correct.

Incomplete Grade Policy:
Incomplete grades will be given only in special circumstances as outlined in university policy as stated in "The University of Arizona Record General Academic Manual."

Student Responsibility for Managing Their Course Progression: Although I try to help guide you through the course, it is ultimately the responsibility of the student to direct their course progress, including following the course schedule, minding due dates, keeping up with required readings, and participating in all class components. All due dates are listed in the syllabus and on the course calendar. If you find that you are having trouble keeping up with course material, please feel free to sign up for Remind text message reminders (more information about how to sign up will be provided via email and posted to the News board at the beginning of the semester).

Late Assignments: No late work or make-ups are allowed for exams or active learning discussions (ALDs). All due dates are listed clearly in the course calendar, so you will need to plan your schedule accordingly to get assignments completed on time. Late project assignments are penalized at a rate of 10% off per day late, including weekends. No late assignments will be accepted in excess of **one week** past the original due date.