

Animal Physiology

Syllabus

Course Description. Lectures and laboratories are concerned with the mechanisms by which animals function. The prevailing theme is the biology of the whole animal. Regulative and integrative mechanisms in animal organ systems are examined. Students may receive Biology elective credit for this course or BIOL 365/366 but not both. Restricted to majors. *Prerequisites:* Proficiency in Basic Requirement and BIOL 300 or BIOL 335. Offered every spring. Credits: 0–4.

Course Meetings.

Monday, Wednesday, Friday	11:30 am – 12:20 pm	ISC 137
Thursday Lab	10:00 am – 12:50 pm	ISC 203

Instructor. Dr. Mackenzie Gerringier ISC 255 gerringier@geneseo.edu

Office Hours. Mon.: [2:30 – 4:00 pm](#), Fri.: [10:00 – 11:30 am](#), and By Appointment

Office hours are your time for getting questions answered, course expectations clarified, advice on pursuing opportunities or careers in science and more. Office hours an important opportunity for us to check in. Consider regular office hours as part of this course, rather than remedial. Please email me (gerringier@geneseo.edu) if you have questions or would like to set up a meeting outside of office hours. Office hours and appointments will be held via Zoom.

Course Objectives. In our course, we will:

- Explore the basic physiological principles common to animals, relating structure to function.
- Compare physiological systems across the animal kingdom, including through in-depth topic presentations.

- Integrate our understanding of physiology across levels, from molecular to organismal, and understand interactions between different physiological systems.
- Gain hands-on experience in animal physiology, hypothesis formation, experimentation, and data analysis through both established protocols and independent research projects in the lab.
- Synthesize original data and evidence from the literature and communicate our findings in written, oral, and visual form, improving our science communication skills.

How this course fits into your biology education... This course serves the following Biology Program Learning Outcomes:

1. Students will have the knowledge base and intellectual (conceptual) framework to use reasoning and problem-solving skills to; (1) read critically, (2) evaluate support for competing hypotheses, and (3) critique experimental design. *Level: Mastery.*
2. Students will have the laboratory and inquiry skills and technical ability to formulate hypotheses, design and run experiments using instruments to test their hypotheses, and analyze and interpret the results. They will be able to build on earlier work to design further experiments. *Level: Mastery.*
3. Students will be able to communicate biological ideas from literature or their own laboratory investigations to audiences of biologists and non-biologists in a variety of formats including written reports, poster, and oral presentations. *Level: Reinforcement.*
4. Students will recognize the importance of scientific integrity and ethical research and applications of biology to science policy. They will be able to work independently and in teams for life-long learning. *Level: Reinforcement.*
5. Students will be able to demonstrate a broad and diverse background in biology and related sciences and a strong foundation for graduate and professional programs of study or employment. *Level: Reinforcement.*

Course Expectations. Much of the value of this course will come from active engagement with our class activities and discussions. Therefore, active participation will be part of your course grade. There are many ways to be an active participant in this course, including attending class, asking questions, contributing to class discussions on Canvas, posting current research in Animal Physiology to our Canvas page, and coming to office hours. Please post to a Canvas discussion at least once per week as part of your participation credit for our course.

Full course expectations details are available on our Canvas page. Plan on engaging regularly with Canvas for announcements, discussions, and assignment submissions. See schedule below.

Accessibility & Communication Online. You will be expected to check email and Canvas during the work week on our usual class days (Monday, Wednesday–Friday). Email and Canvas will be important means of communication as a class. I will be accessible via Canvas and email and will strive for a <24-hour turn-around to questions during the work week. For emails sent after 5 pm or on weekends, please expect a response the next business day. If you find yourself struggling with accessibility, please reach out. I am here to work with you.

Incomplete grades. Geneseo's academic policies state that a temporary grade of "I" (incomplete) may be awarded when a student has been unable to complete a course due to circumstances beyond their control. Contact the instructor directly prior to the end of the semester for incomplete grade arrangements.

Course Materials. Our textbook is *Animal Physiology: From Genes to Organisms*. Sherwood, Klandorf, & Yancey. An e-book version can be purchased from the bookstore and there is a copy available on four-hour course reserve.

Making the most of the textbook: Textbooks are a great resource but highlighting every line and trying to memorize the book will only get us so far. Instead, try this approach: Before the lecture, spend 10–15 minutes skimming through that day's reading. Look for major themes, new vocabulary words, and important figures. Ask yourself what questions you have from looking briefly at this section. Jot down a few notes. Then, attend the lecture. After, write the major takeaways from that day down for yourself. What questions do you still have? Now, read the textbook. Your familiarity with the topics should make it easier to follow and remember the reading. Write down the important notes from this section. What questions do you still have? Post them in the discussions on Canvas. To check your understanding and prepare for exams, try teaching the material to someone else. Vocabulary lists and learning objectives will set expectations on testable material, but you are encouraged to continue challenging yourself throughout the semester and to dive deeper into topics.

Scientific Papers. We will also explore current research in animal physiology. Four required readings from the primary literature are available on Canvas. Article response worksheets will help you develop strategies for reading scientific papers and serve as notes for future reference. Please submit these article responses for three of the four readings. For one reading of your choosing, we will have a mini-journal club to discuss the studies, questions we come across, and what we'd do next to advance the field.

Course Technology. Additional materials will always be available on Canvas for those looking to dive deeper into these topics. We have discussion threads and pages for questions about the course, material, or research opportunities. If you see internship opportunities or neat physiology news, please share! We will also be learning and using some common tools for analyzing physiological data, including R. All software will be freely available to download, with links provided on Canvas.

Assignments & Assessment.

Assessment in this course will be based on the following, out of a total of 500 points.

Article Responses *10% of grade*

Four scientific journal articles will supplement the textbook reading and allow us to explore specific animal systems in detail. For three articles, write a short response on the worksheet provided (*10 points each*). Article responses must be written in your own words to receive credit. For one article, join the instructor in groups of three for a short (~25 min) journal club discussion on the reading (*20 points*). See schedule below for article due dates.

Comparative Physiology Talks *15% of grade*

We have the opportunity to not only explore physiological systems, but to compare the physiology of multiple animals to gain insight into adaptation and evolution. In a well-researched and well-synthesized talk, you will dive into a specific system and compare the physiology of ~three related species using the scientific literature. These 15-minute talks will take place throughout the semester, corresponding to our weekly themes. At least two weeks prior to your talk, please submit a topic and formatted sources for review. The earlier you submit a topic, the earlier you will get feedback. You will be assigned two talks to peer review. Reviews should be submitted to Canvas by the Monday after the talks.

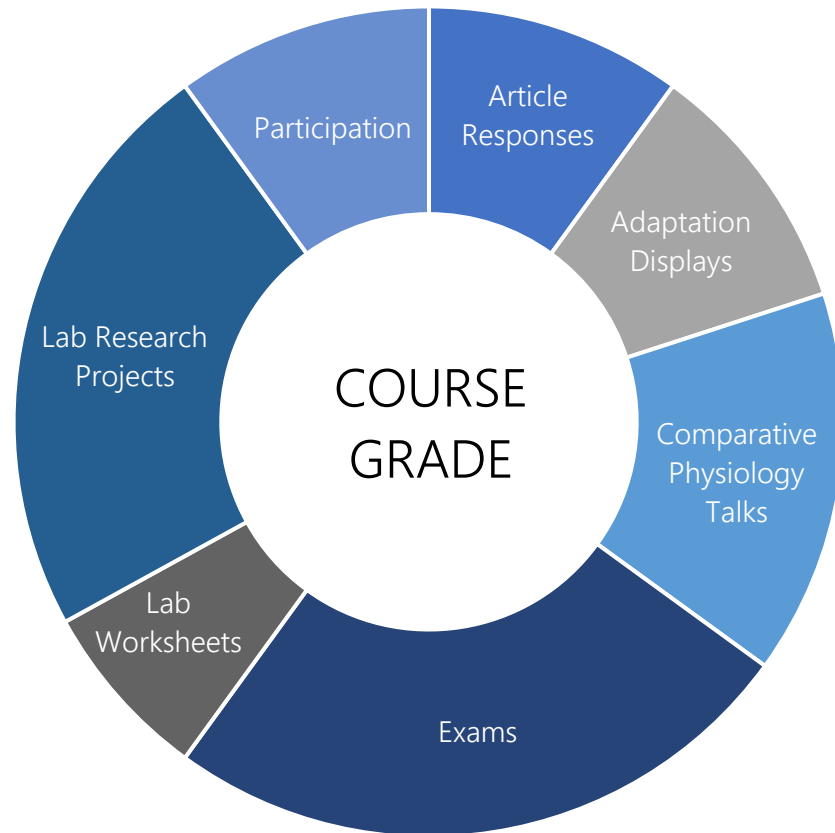
As audience members, you should ask at least one question per week. You can ask questions either in person or on Canvas. Thank you for keeping your comments supportive, respectful, and constructive. Speakers, please answer your questions on Canvas by the Monday following your talk. You are responsible for keeping track of your talk and peer review deadlines.

Sign-Ups	Feb. 11 th	
Topic Submission	Two Weeks before Talk	<i>15 points</i>
Talks	Throughout Semester	<i>50 points</i>
Talk Reviews	Monday after Talks	<i>10 points</i>

Adaptation Display *10% of grade*

Create a beautiful and informative interpretive sign for a public audience that would appear at a national park, describing multiple physiological adaptations of a species of your choice.

Earn full credit for participation (50 pts) by attending class when safe to do so, actively engaging in discussions and activities, and contributing to discussions (at least one post per week) on Canvas. You will not be evaluated on whether your insights are "right" or "wrong" during discussions or check-ins, think critically and be actively involved. All submitted work and discussion responses should be written in your own words to receive credit. If you need to miss a synchronous class session due to illness, please complete the module for that day's subject on Canvas within one week of the missed class.



Resources & Policies.

Lab Policies. Safety is our first priority. Close-toed shoes and long pants/skirt are required for participation in lab. Please be mindful of your own safety and the safety of your peers. Detailed lab policies will be discussed in class and available on Canvas and in the lab worksheets.

Some lab activities involve measuring aspects of our own physiology, such as heart rate. These self-subject experiments can be valuable learning opportunities but are entirely voluntary. Students will not be penalized for electing to not participate. Please see the instructor for alternative activities the week before the lab. Note that all experiments are for educational, rather than medical, purposes. Please consult your primary care physician for health recommendations.

Late Work Policy. Talk deadlines will vary depending on which subject you sign up for. It is your responsibility to keep track of all deadlines. If you have questions, please don't hesitate to ask. Late work will only be accepted with extenuating circumstances. All late work accommodations need to be discussed in advance of the due date. Any questions on assignment grades need to be submitted within two weeks of receiving feedback for grade revisions to be considered.

Accessing Feedback on Canvas. Feedback will be provided through Canvas, in the form of general comments, rubrics, and through specific comments on the documents themselves. Access specific comments by following the 'View Feedback' link. Here is a video detailing this process: https://www.youtube.com/watch?v=Jcl1NOUFYf8&ab_channel=RichardRafferty

Geneseo Mission and Values. SUNY Geneseo has several core documents that articulate our shared commitments and learning objectives. These include:

- SUNY Geneseo Mission, Vision and Values:
 - <https://www.geneseo.edu/about/mission-vision-and-values>
- Community Commitment to Diversity, Equity, and Inclusion:
 - <https://www.geneseo.edu/diversity/commitment>
- Geneseo Learning Outcomes for Baccalaureate Education:
 - <https://www.geneseo.edu/provost/globe-geneseo-learning-outcomes-baccalaureate-education>

Academic Support Services. The campus provides a range of support services to help students thrive in their classes. These services include: Tutoring, both drop-in and by-appointment, with student tutors in the Writing Learning Center, the Math Learning Center, and a range of department-based tutoring centers

- Online tutoring through the SUNY-wide STAR-NY system (www.starny.org/tutoring_schedule)
- Supplemental Instruction, in which trained student assistants review lecture material from specific classes. Information on times and locations is available through the [Center for Academic Excellence website](#)

Additionally, the college offers a number of peer mentoring programs that are designed to reinforce good academic habits. These include:

- Academic Peer Mentors in the Office of Academic Planning and Advising provide students with promising study strategies and can host on-going appointments with students seeking an "accountability buddy". More information is available at: https://www.geneseo.edu/dean_office/academic-peer-mentors-0
- The ONYX Academic Success workshop series sponsored by the GOLD Leadership Program introduces students to a variety of study skills, time management techniques, and instruction on how to access campus resources for academic and career guidance. A full list of GOLD workshops can be accessed at
 - <https://www.geneseo.edu/gold/app/browse>

- Tutoring, both drop-in and by-appointment, with student tutors in the Writing Learning Center, the Math Learning Center, and a range of department-based tutoring centers

Library Research Help. Geneseo's Library staff has created online research guides, self-help databases, and are available for individual consultation. Research Librarians are available for walk-in consultations and students may request appointments with staff experts in particular fields. Full information on library research resources, hours, and consultation options is available at www.geneseo.edu/library/ask-us. Students, faculty, and staff will be able to schedule research consultations with librarians via Zoom or another medium, using the same link as in past semesters: geneseo.edu/library/researchconsultations

In lieu of in-person drop-in hours, the librarians are staffing LibChat, a service that allows for online, chat-based synchronous communication. LibChat is available Mondays–Fridays. Access it by clicking on the green owl icon, which is located throughout the library website. While electronic resources will continue to be accessible, Milne's physical collection will have limited access. Faculty, staff, and students are encouraged to use IDS to borrow materials from other libraries. For information about IDS and library services as a whole, see geneseo.edu/library/library-service-information

The librarian for our course is Dr. Jonathan Grunert, grunert@geneseo.edu.

Academic Integrity and Plagiarism. All work submitted in this class needs to be in your own words. This includes article responses, lab worksheets, and exams. For lab worksheets, you may discuss questions in groups, but each person needs to write their own original responses to questions. Submitting uncredited work in any form will result in a zero for the assignment. The library offers online workshops to help students understand how to paraphrase, quote, and cite outside sources properly. These sessions are meant to educate about the importance of using original ideas and language, and how to incorporate paraphrases and quotes into writing. The complete list of library workshops can be found at:

www.geneseo.edu/library/library-workshops

Academic dishonesty includes cheating, knowingly providing false information, plagiarizing, and any other form of academic misrepresentation. Academic dishonesty will not be tolerated in this course. College policies and procedures regarding academic dishonesty are available at:

www.geneseo.edu/handbook/academic-dishonesty-policy

Computer and Technology Support. To help reduce the spread of COVID-19, the CIT HelpDesk will not be available for walk-in appointments this fall semester. Contact us at 585-245-5588 and our HelpDesk technicians will help you over the phone or schedule a follow-up appointment if necessary. Individuals looking to [borrow equipment](#), such as video adapters, cameras, projectors, and laptops will be able to do so from the Library Service Desk.

Getting Help from CIT. For the fastest response to technical questions or issues, please call the CIT HelpDesk at 585-245-5588. If you are unable to reach us by phone, please leave a voicemail, and we will follow up within one business day. You can also submit a ticket through the [CIT Service Desk](#)

[Portal](#). If you prefer, for non-critical issues, you may also submit a ticket via email at helpdesk@geneseo.edu.

For assistance with your computer or mobile device, visit the CIT HelpDesk in Fraser. CIT provides self help guides on a range of computer issues, including access to the campus network, Canvas, printing, software guides, and other resources. The CIT Self Help Guides at wiki.geneseo.edu/display/cit/CIT+Self+Help can be helpful in finding quick solutions to basic technology issues. Geneseo students, faculty and staff have FREE access to the entire [LinkedIn Learning training library](#) (over 7,500 courses, including tutorials for software, digital tools, web development, programming, and design) through Geneseo's site license. For more information, [visit this wiki page](#). (<https://wiki.geneseo.edu/display/cit/LinkedIn+Learning+Training+Library>)

Course Accessibility. We will be happy to make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will be made for medical conditions related to pregnancy or parenting. SUNY Geneseo is dedicated to providing an equitable and inclusive educational experience for all students. The Office of Accessibility will coordinate reasonable accommodations for persons with physical, emotional, or cognitive disabilities to ensure equal access to academic programs, activities, and services at Geneseo. Students with letters of accommodation should submit a letter to each faculty member and discuss their needs at the beginning of each semester. Please contact the Office of Accessibility Services for questions related to access and accommodations.

Office of Accessibility Services
Erwin Hall 22
(585) 245-5112
access@geneseo.edu
www.geneseo.edu/accessibility-office

Roles & Responsibilities. Student: inform the instructor no later than the first week of the semester of any accommodation(s) you will or may potentially require.

Instructor: maintain strict confidentiality of any student's disability and accommodations; support all students to meet the learning objectives of this course.

All course materials are available on Canvas and I've made every attempt to ensure that they are accessible to everyone. If you have difficulties accessing any materials (including needs for alternative formats), please let me know as soon as possible and I will rectify the situation.

Religious Observations and Class Attendance. Student attendance in classes on religious holidays is governed by New York State Education Law 224-a (see <https://www.geneseo.edu/apca/classroom-policies>). Students who anticipate an absence due to religious observations should contact their faculty member as soon as possible in advance to arrange make up plans.

Bias-Related Incidents. "We are here to listen, to learn, to teach, to debate, to change, to grow. We should all be safe to pursue these goals at SUNY Geneseo while being who we are. Together, we

commit ourselves to pluralism, cultivating a community that respects difference and promotes a sense of inclusion and belonging.”

As this excerpt from our Community Commitment to Diversity, Equity, and Inclusion states, here at SUNY Geneseo, we want to provide a space where everyone feels welcome to learn and grow in their identities as well as in their role as students, faculty, and staff. If in the unfortunate instance you experience an incident of bias, we encourage you to reach out to the Chief Diversity Officer (routenberg@geneseo.edu) and/or our University Police Department. In trying to create an environment that facilitates growth through diverse thoughts and ideas, reporting incidents of bias—including threats, vandalism, and microaggressive behaviors—can help bring a better understanding of our campus climate as well as provide opportunities for learning and restoring harm. Hateful speech or actions will not be ignored in our class.

Student Well-Being is a priority in this class, to support the achievement of academic goals and alleviate stress. Eating nutritious foods, getting enough sleep, exercising, avoiding drugs and alcohol, maintaining healthy relationships, and building in time to relax all help promote a healthy lifestyle and general well-being. Concerns about academic performance, health situations, family health and wellness (including the loss of a loved one), interpersonal relationships and commitments, and other factors can contribute to stress. Students are strongly encouraged to communicate their needs to faculty and staff and seek support if they are experiencing unmanageable stress or are having difficulties with daily functioning. Please feel free to reach out to me if you have questions or concerns. The Dean of Students (585-245-5706) can also assist and provide direction to appropriate campus resources. For more information, see www.geneseo.edu/dean_students.

Mental Health Resources. As a student, you may experience a range of challenges that can impact your mental health and thus impact your learning; common examples include increased anxiety, shifts in mood, strained relationships, difficulties related to substance use, trouble concentrating, and lack of motivation, among many others. These experiences may reduce your ability to participate fully in daily activities and affect your academic performance.

SUNY Geneseo offers free, confidential counseling for students through the Lauderdale Center for Student Health and Counseling and seeking support for your mental health can be key to your success at college. You can learn more about the various mental health services available at health.geneseo.edu

Health and Well-being in a Stressful Time. The changes brought on by COVID-19 have impacted us all in a number of ways and will continue to do so at various times and to varying degrees during the upcoming semester. Your health and wellbeing are foundational to your ability to learn, and if you find that you are feeling unwell (physically or mentally) and it is impacting your ability to complete your coursework, please reach out. Because the learning environment will be different than it has been in the past, the indicators that usually let you know something is wrong may not be as clear to you or those around you as they would be during a typical semester. Additionally, the ways in which you normally engage in self-care may have been disrupted. Please remember that it's never too late to ask for help. The [Dean of Students](http://www.geneseo.edu/dean_students) (585-245-5706) can assist and provide direction to appropriate campus resources. The college also has collected resources in a [Coping with COVID webpage](#).

In a similar way, I may occasionally ask for some patience and flexibility on your part. The pandemic is affecting faculty as well as students and creating demands that would not be present in an ordinary semester. You will never suffer any disadvantage in the course because of delays on my part. Remember that we are all in this together.

Parents. Students who are parenting will be supported in this class. I ask that all students work with me to create a welcoming environment that is respectful to all forms of diversity, including diversity in parenting status. All exclusively breastfeeding babies are welcome in our class sessions as often as is necessary. For older children and babies, I understand that unforeseen disruptions in childcare and pandemic-related changes often put parents in the position of having to miss class to care for a child. While not a long-term childcare solution, occasionally bringing a child to lecture to cover gaps in childcare is perfectly acceptable. Children should not be brought to lab for safety reasons. If babies and children come to class, I ask that you be mindful to avoid disrupting learning for other students. Finally, I understand that often the largest barrier to completing your coursework as a parent is the tiredness many parents feel in the evening once children have gone to sleep. While I maintain the same high expectations for all students in my classes regardless of parenting status, I am happy to problem-solve with you in a way that makes you feel supported as you strive for school-parenting balance.

Food Security. SUNY Geneseo students who find themselves in a position of food insecurity and do not have the financial resources to support their food and nutrition needs can access the Geneseo Groveland Food Pantry located at the First Presbyterian Church, 31 Center Street in Geneseo. Students can utilize the pantry once with no referral or contact with the College. At this visit they will be provided items that will address their basic needs for several days. If a student continues to face difficulties providing for their own nutritional needs beyond their first visit to the pantry they should connect with Susan Romano, Director of Financial Aid to receive a brief letter that they will present to the staff at the pantry that verifies their need. If students do not have a FAFSA on file for any reason they should contact Dr. Leonard Sancilio, Dean of Students, to discuss their particular situation and options. The Geneseo Groveland Food Pantry is open on the following days and times: Tuesday: 10 AM–2 PM; Wednesday: 4 PM–6:30 PM; Thursday: 10 AM–2 PM

If you have any questions please contact Dr. Leonard Sancilio, Dean of Students at: sancilio@geneseo.edu or 585-245-5706.

Students can access the form below, provide basic information, and request items be delivered on campus or in the community, or picked up on campus. Students can also go directly to the pantry [during open hours](#) if that is more convenient. Once you complete the form you will be contacted by a member of FSA with next steps, and you will receive your food items the following week.

Any student can request food items one time without any referral. To receive food items after the initial utilization of the system, students must secure a letter from the [Financial Aid office](#) verifying their need based on their specific circumstances. Please connect with me if you need support around this requirement.

[SUNY Geneseo Food Pantry Request Form](#)

Diversity and Equity. It is my intent to create a learning environment that supports all students. I believe the diversity that you bring to this class should be viewed as a resource, strength, and benefit. I strive to present materials and activities that are respectful of gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture. Your suggestions are encouraged to improve the course's effectiveness personally, or for other students or student groups. For ideas, questions, or concerns related to diversity, equity, and inclusion in the Biology Department, please reach out to bio-diversity@geneseo.edu.

Resources for Physiology & Biomedical Sciences Grad Program. Let's talk jobs in office hours!

<https://www.physiology.org/career/teaching-learning-resources/graduate-physiology-biomedical-science-catalog?SSO=Y>

Information Regarding the Use of Animals for Teaching Purposes. This is an Animal Physiology course. The course attempts to introduce students to the discipline of physiology by examining physiological organ-systems, as well as the molecular principles that underlie higher level integrative bodily functions. The laboratory component of the course serves to emphasize and reinforce the topics discussed in lecture. Many of the laboratory exercises in this class use reductionist models, computer simulations, and/or use student subjects for non-invasive measurements of physiological parameters. In some cases, however, it is not possible to effectively teach physiological principles by these methods. Therefore, a few laboratory exercises use animal subjects to demonstrate the importance of the physiological principles being discussed. Every effort is made to ensure humane treatment of these animals. Disrespectful treatment of lab subjects will not be tolerated.

Some students find it difficult to take part in the experiments in which animals are used. These students should meet with the instructor as soon as possible. In cases in which the student does not wish to participate in these experiments, alternative exercises may be assigned instead. If you think that you may have difficulties with the animal experiments, please talk to me as soon as you can.

For information regarding responsible use of animals in teaching and biomedical research, please visit the web sites of the following societies/organizations:

- American Physiological Society (www.the-aps.org)
- Federation of American Societies for Experimental Biology (www.faseb.org)
- American Association for Laboratory Animal Science (www.aalas.org)
- Association for Assessment and Accreditation of Laboratory Animal Care International (www.aaalac.org)
- Office of Laboratory Animal Welfare (OLAW). Office of Extramural Research, National Institutes of Health, U.S. Department of Health and Human Services (www.grants.nih.gov/grants/olaw/)
- Institutional Animal Care and Use Committee (www.iacuc.org)

BIOL 364: ANIMAL PHYSIOLOGY

SCHEDULE

Week 1: Foundations of Physiology

Jan. 26	Welcome to Animal Physiology	1.1
Jan. 27	Lab 1: Lab Orientation, Animal Diversity	
Jan. 28	Foundations of Physiology	1.2–1.4

Week 2: Homeostasis, Feedback, & Animals

Jan. 31	Homeostasis & Feedback	1.5–1.7
	Comparative Physiology Talks: Expectations & Resources	
Feb. 2	The Animal Kingdom	
Feb. 3	Lab 2: Countercurrent Exchange Lab	
Feb. 4	Careers in the Veterinary Sciences	

Week 3: Cells & Molecules

Feb. 7	Cellular & Molecular Physiology	2.1–2.6
Feb. 9	Cellular & Molecular Physiology	2.7–2.13
Feb. 10	Lab 3: Metabolism Lab	
Feb. 11	Membrane Physiology	3.1–3.5
	Due: Sign up for a Comparative Physiology Talk	
	Complete <i>Avoiding Plagiarism Tutorial</i> on Canvas	

Week 4: Neuronal Physiology

Feb. 14	Neuronal Physiology	4.1–4.4
	Adaptation Displays: Expectations & Resources	
<i>Feb. 16</i>	<i>Diversity Summit</i>	
Feb. 17	Lab 4: Physiological Genomics Lab	
Feb. 18	Neuronal Physiology	4.5–4.8, Musser <i>et al.</i> 2021
	Due: Article Response: Musser <i>et al.</i> , Nervous System Evolution	

Week 4: Nervous Systems

Feb. 21	Nervous Systems	5.1–5.3
Feb. 23	Nervous Systems	5.4–5.7
Feb. 24	Lab 5: Earthworm Action Potential Lab	
Feb. 25	Nervous Systems & Talks	
	Due: Adaptation Display Topic & Source Check	

Week 5: Nervous Systems

Feb. 28	Nervous Systems	5.8–5.9
Mar. 2	Nervous Systems & Sensory Physiology	6.1–6.5
Mar. 3	Lab 6: Sensory Physiology Lab	
Mar. 4	Sensory Physiology & Talks	Guignard <i>et al.</i> 2021
	Due: Article Response: Guignard <i>et al.</i> 2021, Hymenopteran UV Vision	

Week 6: Sensory Physiology

Mar. 7	Sensory Physiology	6.6–6.9
Mar. 9	Mid-Term Review	<i>Ch 1–6 Summaries</i>
Mar. 10	Lab 7: Thermoregulation Lab	
Mar. 10–11	Mid-Term Exam, 20 min meetings	

Mar. 14–18: Spring Break

Week 7: Endocrine Systems

Mar. 21	Endocrine Systems	7.1–7.4
Mar. 23	Endocrine Systems	7.5–7.8
Mar. 24	Lab 8: Dialogue with Local Vets, Bring Questions	
	Introduction to our Research Projects	
Mar. 25	Endocrine Systems & Talks	8.3–8.4, Pla <i>et al.</i> 2021
	Due: Article Response, Pla <i>et al.</i> 2021, Hermaphroditism in Fish	

Week 8: Muscle Systems

Mar. 28	Muscle Physiology	8.5–8.6
Mar. 30	Muscle Physiology	8.7–8.8
Mar. 31	Lab 9: Research Projects	

Due: Research Proposal & Collaboration Plan

Apr. 1 Skeletal Systems & Talks

Week 9: **Circulation**

Apr. 4 Circulatory Systems 9.1–9.5

Apr. 6 Circulatory Systems 9.6–9.10

Apr. 7 Lab 10: Research Projects

Apr. 8 Circulatory Systems & Talks 9.11–9.16

Due: Adaptation Displays

Week 10: **Defense & Respiration**

Apr. 11 Defense Systems 10.1–10.4

Apr. 13 Defense Systems 10.5–10.8

Apr. 14 Lab 11: Research Projects

Due: Research Update & Introduction

Apr. 15 Respiratory Systems & Defense Talks 11.1–11.5

Week 11: **Respiration & Excretion**

Apr. 18 Respiratory Systems 11.6–11.10

Apr. 20 Excretory Systems 12.1–12.10

Apr. 21 *GREAT Day, No Lab*

Apr. 22 Excretory Systems & Talks Penso-Dolfín *et al.* 2020

Due: Article Response: Penso-Dolfín *et al.*, Weddell Seal Diving

Week 12: **Fluid & Acid-Base Balance**

Apr. 25 Fluid Balance 13.1–13.4

Apr. 27 Acid-Base Balance 13.5–13.8

Apr. 28 Lab 12: Research Projects

Apr. 29 Digestive Systems & Talks 14.1–14.5

Week 14: **Digestion & Thermoregulation**

May 2 Digestive Systems 14.6–14.10

May 4 Thermal Physiology 15.1–15.4

May 5 Lab 13: Research Projects

Due: Research Paper Drafts

May 6 Thermal Physiology & Talks 15.5–15.8

Week 15: **Putting it Together**

May 9 Reproductive Physiology & Talks 16.1–16.7

May 11 Putting it Together: Final Review *Ch 1–16 Summaries*

May 12 Lab 14: Research Symposium

Due: Final Research Papers

Final Exam Available from 1:00 pm

Week 16: **Final Exam**

May 18 Final Exam Due by 5 pm

May 20 12:00 – 3:20 pm Final Exam Period