BIOLOGY 310: Animal Physiology Course Syllabus

Instructor Office: Email:	Dr. Julie Schram (she/her) Anderson 205F, Phone 796-6599 jbschram@alaska.edu
Office hours:	Tuesday 1- 4 pm, in person or virtually in Office hr zoom room (Meeting ID: 498 711 7046; Passcode: 978173) or by appointment
Lecture:	Monday, Wednesday, Friday 8:18-9:15 am REQUIRED TEXT: Hill, RW; Wyse, GA; and Anderson, M. Animal Physiology. 3rd or 4th edition. Sinauer Press.
Laboratory	BIOL 310 J01: Thursday 8:15-11:30 am in AND 314 REQUIRED LABORATORY MATERIALS: There will be handouts and other readings available on *Blackboard*.
Pre-requisites	Biology 105 and 106, Math 107, Chemistry 105 and 106

Course Overview:

This course is designed to establish a firm understanding of the physiological processes driving animal function from the cellular to the organismal level. We will take a comparative and theoretical approach to understanding processes such as neurophysiology, metabolism, endocrinology, osmoregulation, muscle physiology, respiration, and circulation.

We will consider both anatomical and functional differences in physiological structures in vertebrates and in invertebrates. This class will emphasize chemical and physical details of diverse metabolic processes by integrating interactive lectures in the classroom, discussions of primary literature during lectures, and experiential learning in the laboratory.

Learning Objectives:

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

- Explain the physiological mechanisms that adapt organisms to a particular environment
- Compare and contrast organismal adaptations across a diverse group of species
- Interpret primary literature results through reading and discussions of peer reviewed literature
- Summarize research literature succinctly to communicate results to a general audience consistent with scientific writing standards

Class Blackboard website:

You can find a copy of the syllabus, assignments, lecture notes and outlines as well as your grades on the UAS Blackboard web site for this course. Lecture notes will usually be posted sometime after the lecture. Please check your e-mail account that is associated with your class registration on a regular basis or have your mail forwarded to ensure you don't miss announcements. I will post or email information regarding schedule changes, due dates and other information you would not want to miss throughout the course.

Course Requirements

1) Read required materials and come to class ready to discuss the readings.
2) Participate in lecture and laboratory discussions and activities.
3) Research, develop, and prepare presentations of recent research.
4) Complete all exams.

General Course policies:

- Attendance is expected. Students are responsible for all materials presented and discussed during class periods, including instructor, guest lectures and peer presentations. I expect students to arrive to class on time and prepared to discuss assigned material; you are responsible for material covered in the textbook.
- Class participation is a significant portion of this course. There will be individual and/or group activities for which students receive credit as part of their daily class participation. There are no make-ups for missed participation points unless accompanied by an appropriate excuse (see below).
- If a student is ill or otherwise unable to attend class, contact your instructor before you miss class to obtain an alternate assignment to take the place of missed participation points and, if necessary, arrange a make-up exam. If you are ill you must present a dated medical documentation of your illness within one week of the absence.
- There will be limited opportunities for extra credit. Extra credit will only be available for the entire class; there will be no individual extra credit. There will not be sufficient opportunities for extra credit to make up for any assignment.

Expectations and Evaluation:

- I expect students to enter this class with a good background in Chemistry and Biology because I rely on these important foundations in my presentations of course material.
- Lecture subjects are noted in the attached syllabus schedule, you are expected to attend/view all lectures.
- Please read the assigned material before coming to class.
- Late assignments will be docked a minimum of 1 point for every day past the due date.
- The syllabus may be revised. Some minor adjustment may be necessary to make additional time for certain subjects or less for others.
- I encourage questions during class and welcome classroom and laboratory discussion.
- I expect you not to cheat on exams or plagiarize material for written assignments. Any student found cheating/plagiarizing will be punished to the maximum extent

allowable by the University. Please take time to review the section on Student Rights and Responsibilities Regulation in your UAS catalog. We will have a short discussion about this topic during the first laboratory meeting.

Cell Phones:

Cell phones are not allowed during lecture and may be used in the laboratory for learning purposes only. Thank you for your respect

Grading Policies:

Your grade will be earned based upon a total of 750 points earned in lecture and laboratory. Total points will be earned as follows: 4 Exams (450 points); Laboratory Final (100 points); Laboratory notebook (50 points); Science Summaries (50 points); Professionalism (50 points)

Assignment	# Assessments	Points per assignment	Total points per assignment
Midterms	3	100	300
Lecture final exam	1	150	150
Laboratory final exam	1	100	100
Laboratory notebook	1	50	50
Science summaries	10	10	100
Professionalism	10	5	50
Total Points possible:	---	---	750

Your grade will reflect your accumulation of points over the course and breakdown as follows:

Points	Grade percentage	Letter grade
≥ 675	≥ 90%	A
600 - 674	80 – 89%	B
525 - 599	70 – 79%	C
450 - 524	60 – 69%	D
≤ 442	≤ 59 %	F

*Incompletes are only given in the cases of medical emergencies

*I reserve the right to assign $^{+}$ and $^{-}$ grades.

Exams:

Exams will consist of multiple choice, short answer and essay questions to examine your breadth and depth of knowledge about assigned topics in physiology. Make-up examinations are given only with the **prior** approval of the instructor. The final exam will include 100 points related to recent material and 50 points related to cumulative course material

Late Assignments:

You will lose 10% of your grade for each day that an assignment is turned in after the deadline. All assignment due dates are stated in your syllabus. I do not accept assignments that are one week overdue.

Laboratory Overview:

All students will participate in the laboratory component of this course, which serves to provide an experiential approach to understanding the more difficult concepts of this course.

- Laboratory exercises are designed to complement the lecture portion of the course and serve as a forum for student and professor discussions and interactions.
- Laboratory exercises will demonstrate physiological concepts and methodologies through experimental techniques as well as through the use of computerized interactive demonstrations when appropriate.
- Students will work in teams and class-wide experimental results will be analyzed using Excel and appropriate statistical software.
- When possible, we will conduct experiments using invertebrate animals commonly found in the local marine and terrestrial environments.
- At other times we (and I mean each of you) will serve as the "laboratory animal.
- After completion of the laboratory, you will learn about contemporary equipment used in physiology laboratories (fluorometric oxygen sensors, micropipettes, osmometers, microscopes, balances and more).
- You will become proficient at graphing and analyzing your data.

Laboratory Attendance:

Laboratory participation is important to fully understanding the concepts presented in this course and helps the instructor evaluate each student's strengths and weaknesses in conducting hands-on physiological experiments.

The laboratory sessions are important for learning how to correctly use physiological equipment (microscopes, osmometers, spectrophotometers, and respirometers), acquiring and analyzing experimental data, and improving your critical thinking skills.

Attendance in the laboratory is mandatory and missing more than one scheduled laboratory will negatively affect your course grade. If you need to miss a lab, contact myself and Sara Caldwell (skcaldwell@alaska.edu) prior to a missed lab for a lab absence to be excused. If a student has more than two **unexcused** absences of laboratory sessions, an F will be assigned for the course grade. An excused absence does not include regular work conflicts or vacation travel.

The Laboratory Notebook:

Laboratory handouts will serve as your laboratory introductions and instructions, and all of these are available through UAS Blackboard. I will provide printed materials prior to the laboratory. Although you will work in groups during the laboratory, you need to maintain an independent physiology notebook. You should document all procedures (as they deviate from the handout), describe your observations, and note any flaws in the experiment that may have bearing on data analysis. You should always make notes concerning changes in protocol. Use this notebook to draw all the histological examinations including microscope settings, include graphs, and answer all the laboratory exercise questions completely. Graphs ***must*** be plotted using computerized methodology. If you are unfamiliar with Excel, this course will allow you to become more familiar with using this program for generating graphs. Computer services are available

to assist in graphics if you require additional training. All physiology labs should include a short conclusion. The complete laboratory notebook is worth 50 points.

Laboratory Exam:

There will be a laboratory exam given at the end of the semester to assess your laboratory skills objectively. The laboratory exam will require that you identify all the types of equipment that we used, identify histological specimens that we observed, and will require that you prepare a physiological buffer. You will be responsible for all the information that you learned in the laboratory. The exam will be worth 100 points and you will be able to use your notebook during the exam.

SCIENCE Articles:

Students will read an article/note/report out of the Journal SCIENCE or Nature that has some bearing on Animal Physiology each assigned week and turn in a brief summary (abstract) of the reading at the beginning of the laboratory. In your summary, please write out in reference format:
the author
the title of the article (and year)
the journal name
the volume and page numbers

Please limit the summary of your reading to 200 well selected words. I will take off points for spelling and grammar problems. If you submit electronically, you need to be sure that I respond with “thank you or I got it or DONE” email. If I did not respond, your assignment was not received. The SCIENCE assignment will be worth 50 points. You will receive 10 points each time you turn in your summary. You cannot turn in more than one summary a week. The course outline will note the labs in which you will turn in a SCIENCE summary.

UAS Policies

Disability Support:

Students needing accommodations or modifications should contact and arrange to meet with the course instructor. To request accommodations for this and any other UAS courses, please contact Disability Services as soon as possible. Accommodations will need to be requested each semester of attendance.

If you experience a disability and would like information about accommodations, please contact Disability Services, located at the Student Resource Center in the Mourant building. Phone # 907-796-6000. You can also visit the DSS website

Non Discrimination Statement

The University of Alaska is an affirmative action/equal opportunity employer and educational institution. The University of Alaska does not discriminate based on race, religion, color, national origin, citizenship, age, sex, physical or mental disability, status as a protected veteran, marital status, changes in marital status, pregnancy, childbirth or related medical conditions, parenthood, sexual orientation, gender identity, political affiliation or belief, genetic information, or other legally protected status. The University's

commitment to nondiscrimination, including against sex discrimination, applies to students, employees, and applicants for admission and employment. Contact information, applicable laws, and complaint procedures are included on UA's statement of nondiscrimination available at www.alaska.edu/nondiscrimination.

For more information, contact:
UAS Office of Equity and Compliance
11066 Auke Lake Way, Novatney Building 103, Juneau, AK 99801
907-796-6371
uas.titleix@alaska.edu

Student Conduct Policy

Academic dishonesty will not be tolerated, this includes but is not limited to cheating and plagiarism. As stated in the UAS Student Code of Conduct, students are expected to "conduct themselves honestly and responsibly and to respect the rights of other students". If a violation of Academic Integrity (cheating, plagiarism, etc.) and/or the Student Code of Conduct, consequences may include loss of credit, failing grade for an assignment, or if violation is egregious, failure of the course. For additional information on the tolerance and repercussions of academic dishonesty, please contact:

Lori Klein,
UAS Student Conduct Administrator
907-796-6529
laklein@uas.alaska.edu

UAS Mask Policy

Effective June 29th, UAS began requiring students, staff, and faculty to wear a mask on campus and at University-sponsored activities regardless of location. This policy means that we must wear a mask in this class (lab). Please refer to the Face Coverings on UAS Campuses webpage at https://uas.alaska.edu/pub/maskpolicy for any updates to this policy. UAS has masks available at various campus locations should you forget to bring one with you to campus.

Biology 310 Lecture Schedule

Day	*Week*	*Date*	*Topics*	*Reading*
M	1	8/23	Introduction to the course (lecture and laboratory). Animals & their environments	Ch. 1
W	1	8/25	Homeostasis Molecules and cells	Ch. 1-2
Th	*1*	*8/26*	*Lab: no class*	None
F	1	8/27	Molecules and Cells	Ch. 2
M	2	8/30	*No class*	*None*
W	2	9/01	Genomics, Proteomics, and Related Approaches to Physiology	Ch. 2-3
Th	*2*	*9/02*	*Lab: Safety in the laboratory.* **SCIENCE Summary #1 due**	*Handout #1*
F	2	9/03	Genomics, Proteomics, and Related Approaches to Physiology; Break out groups for buffer calculations (30 min)	Ch. 3
M	3	9/06	**No Class (Labor Day Holiday)**	None
W	3	9/08	Transport of Solutes and Water	Ch. 5.
Th	*3*	*9/09*	*Intro to physiology equipment* **SCIENCE summary #2 due**	*Handout #2*
F	3	9/10	Energy Metabolism	Ch. 7
M	4	9/13	Energy Metabolism	Ch. 7
W	4	9/15	Aerobic and Anaerobic Forms of Metabolism	Ch. 8
Th	*4*	*9/16*	*Lab: Transport mechanisms, ionophores and exocytosis,* **SCIENCE summary #3 due**	*Handout #3*
F	4	9/17	Aerobic and Anaerobic Forms of Metabolism	Ch. 8
M	5	9/20	**Midterm #1 (100 points): Physiology fundamentals & bioenergetics**	None
W	5	9/22	Neurons: the ionic basis of the membrane potentials	Ch. 12
Th	*5*	*9/23*	*Lab: Nervous system terminology and histology: Anatomy of invertebrate nervous system; Squid & shrimp dissection;* **SCIENCE summary #4 due**	*Handout #4*
F	5	9/24	Neurons: the ionic basis of the membrane potentials Synapses: where neurons meet effectors: Excitatory & inhibitory post synaptic potentials**.**	Ch. 12-13
M	6	9/27	Synapses: where neurons meet effectors: Excitatory and inhibitory post synaptic potentials. Mechanoreception: Hearing and Balance	Ch. 13-14
W	6	9/29	Mechanoreception: Hearing and Balance	Ch. 14
Th	*6*	*9/30*	*Lab: Sensory physiology (Part 1) & histology* **SCIENCE summary #5 due**	*Handout #5*
F	6	10/01	Photoreception & electroreception	Ch. 14
M	7	10/04	Photoreception & electroreception Endocrine and neuroendocrine physiology	Ch. 14, 16
W	7	10/06	Endocrine and neuroendocrine physiology	Ch. 16
Th	*7*	*10/07*	*Lab: RPCH hormone influences & histology* **SCIENCE summary #6**	*Handout #6*
F	7	10/08	Endocrine and neuroendocrine physiology	Ch. 16

M	8	10/11	Endocrine and neuroendocrine physiology	Ch. 16
W	8	10/13	Muscle Anatomy& Sliding filament theory of muscle contraction	Ch. 16
Th	*8*	*10/14*	*No lab class this week*	*None*
F	8	10/15	**Midterm #2 Neurophysiology and Endocrinology**	None
M	9	10/18	Muscle Anatomy& Sliding filament theory of muscle contraction Muscle Physiology, Energetics and Adaptations	Ch. 20
W	9	10/20	Muscle Physiology, Energetics and Adaptations	Ch. 20
Th	*9*	*10/21*	*Lab: Muscle fatigue & histology of muscle* **SCIENCE summary #7 due**	*Handout #7*
F	9	10/22	Muscle Physiology, Energetics and Adaptations	Ch. 20
M	10	10/25	Introduction to oxygen and carbon dioxide physiology: remembering your gas laws from physics.	Ch. 22-23
W	10	10/27	Oxygen, carbon dioxide, and gas laws from physics	Ch. 24
Th	*10*	*10/28*	*Lab: Respiratory structures & calculation of gas exchange surface area;* **SCIENCE summary #8 due**	*Handout # 8*
F	10	10/29	Transport of oxygen and carbon dioxide in body fluids	Ch. 24
M	11	11/01	Transport of oxygen and carbon dioxide in body fluids	Ch. 24
W	11	11/03	Transport of oxygen and carbon dioxide in body fluids	Ch. 24
Th	*11*	*11/04*	*No laboratory this week. Study for 3rd midterm in your study group*	*None*
F	11	11/05	Transport of oxygen and carbon dioxide in body fluids	Ch. 24
M	12	11/08	**Midterm #3: Muscle and Respiratory Physiology**	None
W	12	11/10	Circulation*:* anatomical considerations *&* electrical activity of the heart	Ch. 25
Th	*12*	*11/11*	*Lab: Bradycardia, heart dissection, & histology* **SCIENCE summary #9**	*Handout #9*
F	12	11/12	Circulation*:* anatomical considerations *&* electrical activity of the heart	Ch. 25
M	13	11/15	Osmoregulation: Introduction and mechanisms	Ch. 27
W	13	11/17	Osmoregulation: Introduction and mechanisms	Ch. 27
Th	*13*	*11/18*	*Lab: Osmoregulation, data graphics & lab concept review* **SCIENCE summary #10 due**	*Handout #10*
F	13	11/19	Water and salt physiology of animals in their environments	Ch. 27-28
M	14	11/22	Water and salt physiology of animals in their environments	Ch. 27-28
W	14	11/24	**No Class (Thanksgiving holiday)**	None
Th	*14*	*11/25*	*Lab: No Class (Thanksgiving holiday)*	*None*
F	14	11/26	**No Class (Thanksgiving holiday)**	None
M	15	11/29	Kidneys and excretion (mostly mammals)	Ch. 29
W	15	12/01	Kidneys and excretion (mostly mammals)	Ch. 29

Th	*15*	*12/02*	*Laboratory Exam (100 points). This is an open NOTEBOOK exam*	*None*
F	15	12/03	Finish up with Kidneys Review for the comprehensive final	

WEEK 16 (FINALS WEEK Dec. 6-10th)
Final Exam: Wednesday December 9th 10:15 am-12:15 pm (150 points)

Other references of interest for Animal Physiology

Hochachka, P.W and Somero, G. N. (2001). **Biochemical Adaptation**, Oxford University Press

Prosser, C. L. (1991). **Environmental and Metabolic Animal Physiology: Comparative Animal Physiology**, 4th edition. John Wiley and Sons, Inc. New York

Prosser, C. L. (1991). **Neural and Integrative Animal Physiology: Comparative Animal Physiology**, 4th edition. John Wiley and Sons, Inc. New York

Randall, D, J., Burggren, W., French, K. (1997). **Eckert Animal Physiology: Mechanisms and Adaptations** 4th Edition, W. H. Freeman and Co.

Schmidt-Nielsen, B. (1995). August and Marie Krogh: Lives in Science, American Physiological Society, Oxford Press

Schmidt-Nielsen, K. (1998). **Animal Physiology: Adaptation and environment**. Cambridge University Press

Schmidt-Nielsen, K. (1972). How Animals Work, Cambridge University Press