DEPARTMENT OF SCIENCE

COURSE OUTLINE – FALL 2019

ZO2410: Animal Physiology I: Homeostasis– 3 (3-1-0) 60 Hours for 15 Weeks

INSTRUCTOR:	Dr. Jessie Zgurski	**PHONE:**	780-539-2863 (Office) 780-903-6313 (Cell)
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OFFICE HOURS:	Mon/Tues 2–5 PM, Wed 2:30-5 PM, Thurs 10-12 PM.		

CALENDAR DESCRIPTION: Survey of physiological systems that regulate levels of gases, food, energy, temperature, water, and ions. Examples from invertebrates and vertebrates.

PREREQUISITE(S)/COREQUISITE: BI1070 (Prerequisite)

REQUIRED TEXT/RESOURCE MATERIALS:
Moyes, C. D., and Schulte, P. M. 2016. *Principles of Animal Physiology, Third Edition*. Pearson Education, Inc., Don Mills, ON. **(Strongly recommended, but not required. Available at GPRC Book Store. The same text will be used for ZO2420).**

DELIVERY MODE(S): Lecture and Seminar

COURSE OBJECTIVES: In this course, we will examine the basic physical and chemical principles that underlie animal physiology, which is the study of how animals function. We will also explore how different animals have adapted physiologically to environmental challenges. This is a two-part course, with part one focusing on energy metabolism, digestion, gas exchange, thermal physiology, and ion and water balance. Part 2 will focus on endocrine regulation, reproductive physiology, the immune system, neurons and the nervous system, sensory systems, muscle physiology, and locomotion.

LEARNING OUTCOMES:

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

- Explain the major mechanisms by which animal cells produce ATP.
- Describe the biochemical pathways that allow various nutrients to be assimilated during digestion, and explain how the structure of an animal's gastrointestinal tract is related to its diet.
- Explain the function of each section of the mammalian GI tract.
- Explain how temperature alters enzyme kinetics, and discuss the various thermal strategies used by animals to keep their body temperatures within acceptable limits.
- Describe the major respiratory mechanisms involved in gas exchange in aquatic and terrestrial animals.

● Compare and contrast the challenges that animals living in salt water, in fresh water, and on land have in maintaining a proper ion and water balance, and explain how the kidneys help maintain ion balance.
● Compare the types of nitrogenous waste produced by the major groups of vertebrates, and know the tissues responsible for its excretion in different groups of animals.
● Using examples, describe how evolution has shaped the physiology of animals living in diverse environments.
● Research and write an essay related to animal physiology, while using and properly citing primary sources as references.

Specific learning objectives for each topic in the course will also be provided on the topic guides that will be posted on Moodle.

TRANSFERABILITY: University of Alberta (including Faculty of Augustana), University of Calgary, University of Lethbridge, Athabasca University, Concordia University College, Canadian University College, Grant MacEwan University, King's University College.

***Warning:** Although we strive to make the transferability information in this document up-to-date and accurate, **the student has the final responsibility for ensuring the transferability of this course to Alberta Colleges and Universities**. Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at Alberta Transfer Guide main page http://www.transferalberta.ca or, if you do not want to navigate through few links, at http://alis.alberta.ca/ps/tsp/ta/tbi/onlinesearch.html?SearchMode=S&step=2

** Grades of D or D+ may not be acceptable for transfer to other post-secondary institutions. **Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability**

EVALUATIONS:

Seminars	25%* (Start Friday, Sept 13th)
Mid-term Exam I (Oct 3)	20%
Mid-term Exam II (Nov 7)	25%
Final Exam	30%

* The seminar grade will be based on a major written assignment (10%) and smaller assignments and quizzes assigned during the seminar (15%). Some of these will be able to be completed during the seminar session.

GRADING CRITERIA:

Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C-**.

Alpha Grade	4-point Equivalent	Percentage Guidelines		Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	90-100		C+	2.3	67-69
A	4.0	85-89		C	2.0	63-66

Alpha Grade	4-point Equivalent	Percentage Guidelines		Alpha Grade	4-point Equivalent	Percentage Guidelines
A-	3.7	80-84		C-	1.7	60-62
B+	3.3	77-79		D+	1.3	55-59
B	3.0	73-76		D	1.0	50-54
B-	2.7	70-72		F	0.0	00-49

COURSE SCHEDULE/TENTATIVE TIMELINE:

The lectures are at H211, Wednesday and Friday from 1:00 – 2:20 PM. The seminars are Friday at J201 from 8:30 – 9:20 AM.

1. Introduction to Physiology – Chapter 1

2. Overview of Enzyme Kinetics and Cellular Metabolism – Chapter 3

A. Energy
B. Enzyme Kinetics
- Enzymes
- Substrate affinity
- K_m, V_{max}, Michaelis-Menton & Lineweaver-Burk equations
- Mechanisms of enzyme control

C. Aerobic and anaerobic metabolic pathways and ATP production

3. Thermal Physiology – Chapter 15

A. Heat fluxes – conduction, convection, radiation
B. Temperature preference, tolerance, resistance
C. Ectotherms, endotherms, heterotherms
- Thermal strategies in ectotherms
  - Behavioural and metabolic compensation
  - Dormancy
  - Freeze avoidance & freeze tolerance
- Thermal strategies in endotherms
  - Environmental heat exchange
  - Heat retention
  - Heat generation
- Thermal Strategies in heterotherms
  - Regional heterotherms
  - Temporal heterotherms

4. Acquiring Energy: Feeding, Digestion and Metabolism – Chapter 14

A. Feeding methods
B. Alimentary systems
C. Influence of diet on gut structure
D. Gastrointestinal secretions
E. Absorption

5. Circulation – Chapter 9

A. Need for vascular systems
B. Components of circulatory systems
C. Diversity of circulatory systems
D. Circulatory systems of vertebrates
E. Flow of blood through the circulatory system
F. Hearts
   - Arthropod hearts
   - Diversity in vertebrate hearts
   - Cardiac cycle
   - Control of contraction
G. Regulation of blood pressure

6. Respiration - Chapter 11

A. Need for respiratory systems
B. Types of respiratory systems
C. Regulation of gas exchange
D. Gas transport
E. Vertebrate respiratory systems – a comparison
F. Respiration in diving mammals
G. Respiration at high altitudes

7. Ion and Water Balance – Chapter 13

A. Ionic and osmotic regulation
B. Nitrogen excretion
C. Evolutionary variation in excretory systems

Exam I is October 4, 2019

Exam II is November 6, 2019

STUDENT RESPONSIBILITIES: Since participation in lectures and completion of assignments are important components of this course, students will serve their best interests by regular attendance at both lectures and seminar sessions.

The objective of the seminars is to clarify information that has been presented in class during the previous week. Readings related to class material will frequently be assigned prior to the seminars, and questions related to the readings will be discussed during the seminar session. Students are asked to read assigned readings prior to the seminars. Videos and other activities will also be incorporated into seminar sessions. Attendance (participation) will comprise a portion of the seminar mark.

Please put cell phones on vibrate or airplane mode during the lectures as a courtesy to the instructor and other students. Many studies have found cell phones to be impediments to learning in class as they are very distracting. You may use a laptop to take notes. Please do not film the class unless it is a part of an approved disability accommodation plan.

STATEMENT ON PLAGIARISM AND CHEATING:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, refer to the Student Conduct section of the College Calendar at http://www.gprc.ab.ca/programs/calendar/ or the College Policy on Student Misconduct: Plagiarism and Cheating at https://www.gprc.ab.ca/about/administration/policies

**Note: all Academic and Administrative policies are available on the same page.