

DEPARTMENT OF SCIENCE

COURSE OUTLINE – FALL 2023

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

Northwestern Polytechnic acknowledges that our campuses are located on Treaty 8 territory, the ancestral and present-day home to many diverse First Nations, Metis, and Inuit people. We are grateful to work, live and learn on the traditional territory of Duncan's First Nation, Horse Lake First Nation and Sturgeon Lake Cree Nation, who are the original caretakers of this land.

We acknowledge the history of this land and we are thankful for the opportunity to walk together in friendship, where we will encourage and promote positive change for present and future generations.

INSTRUCTOR:	Dr. Jessie Zgurski	PHONE:	780-903-6313
OFFICE:	J221	E-MAIL:	JZgurski@nwpolytech.ca
OFFICE HOURS:	Monday 11:30 AM – 12:50 PM, Wednesday 11:30 AM – 2:00 PM, Friday 9:30 AM – 12:50 PM, or by appointment.		

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.

DELIVERY MODE(S): This course is being offered as an independent study course. Weekly readings, assignments, videos, and study guides will be provided to students on the course D2L page. In addition, some recorded lectures will be provided. The instructor will contact students weekly to check their progress and answer any questions or concerns they may have. Additionally, exams will be conducted in-person on the dates indicated below.

LEARNING OUTCOMES: After completing this course, students should be able to:

- Explain the major mechanisms by which animal cells produce ATP.
- Describe how nutrients are 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 gastrointestinal tract.
- Explain how temperature can alter enzyme kinetics, and discuss the various thermal strategies used by animals to keep their body temperatures within acceptable limits.

- Explain the cellular mechanisms that cause cardiac contractions in vertebrates.
- Explain the mechanisms that regulate blood pressure and flow in vertebrates.
- 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.
 - Compare the types of nitrogenous waste produced by the major groups of vertebrates.
 - Explain how mammalian kidneys filter metabolic waste from blood plasma, and how they regulate blood pressure and electrolyte balance.
 - Using examples, explain how evolution has shaped the physiology of animals living in diverse and sometimes extreme 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 the course D2L page.

TRANSFERABILITY: Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at the Alberta Transfer Guide main page <http://www.transferalberta.alberta.ca>.

** Note that a grade 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: Midterm (October 19): 30% (Covers Topics 1 – 4)
 Final Exam: 30% (During exam week) (Covers Topics 5 – 7)
 Quizzes: 10% (6, Online and Open Book)
 Reading Assignments: 20%
 Essay: 10%

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
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:

1. Introduction to Physiology – Chapter 1 (Weeks 1 and 2)

2. Overview of Enzyme Kinetics and Cellular Metabolism – Chapter 3 (Weeks 2 – 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 (Weeks 4 – 5)

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

4. Acquiring Energy: Feeding, Digestion and Metabolism – Chapter 14 (Weeks 5 – 6)

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

5. Circulation – Chapter 9 (Weeks 8 – 10)

- 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 (Weeks 10 – 12)

- 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 (Weeks 13 – 15)

- A. Ionic and osmotic regulation
- B. Nitrogen excretion
- C. Evolutionary variation in excretory systems
- D. Structure and function of mammalian kidneys

STUDENT RESPONSIBILITIES: Students may complete assigned readings and videos at a time that is convenient for them. Please complete quizzes and assignments by the deadlines. Students will be permitted to bring one page of notes into the exams.

STATEMENT ON ACADEMIC MISCONDUCT: Academic Misconduct will not be tolerated. For a more precise definition of academic misconduct and its consequences, refer to the Student Rights and Responsibilities policy available at <https://www.nwpolytech.ca/about/administration/policies/index.html>.

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