

GRANDE PRAIRIE REGIONAL COLLEGE

DEPT. OF SCIENCE & TECHNOLOGY

COURSE OUTLINE

ZO 2410

Animal Physiology I - Homeostasis

Georgia Goth

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Course Description:

This course examines how animals function at the organ/system level of organization. Particular attention is given to the adaptive significance of different modes of functioning. We explore how animals are able to survive in their individual environments. Comparing diverse mechanisms for solving problems, with examples taken from both vertebrates and invertebrates, provides the student with a broad understanding of animal physiology. All animals must solve similar problems related to regulating levels of gases, energy, temperature, water and ions. The process of natural selection has resulted in the formation of various solutions, enabling animals to occupy a wide variety of different habitats.

Prerequisite: Biology 1070

Transferability: Zoology 241, University of Alberta

Textbook: Moyes, C.D. and P. M.Schulte, 2008, Principles of Animal Physiology, 2nd ed, Pearso Pub. Co., 754pp

Delivery Mode: Lecture and seminar delivery. In seminar delivery students will be expected to prepare material beforehand and answer questions orally in class.

Requirements:

This course is a 3-credit course that includes 3 hours of lecture and 1 hour of seminar each week, beginning on September 12th, 2011.

Participation in lectures and seminars is required and regular attendance is expected. Those who choose not to attend must accept the consequences. In this regard, your attention is directed to the *Academic Guidelines of Grande Prairie Regional College*.

All assignments must be completed on time. Late assignments **will not** be corrected. Each week, questions from the appropriate chapters in the textbook will be assigned to each student. Answers will be prepared and presented in the next seminar session. The purpose of these assignments is to help the student keep up with and understand the lecture material. Problems concerning the lecture material will be dealt with during the seminar sessions and, therefore, it is important to review lecture notes before attending tutorials.

Plagiarism will not be tolerated. Any student who plagiarizes will be given a zero on the assignment. A second case of plagiarism will result in expulsion from the course. The instructor reserves the right to use electronic plagiarism detection services.

Course Objectives:

To provide the student with an understanding of the functioning of various organ systems in a variety of animals of differing complexity; to show the student how variations in physiological functioning allow animals to adapt to various types of environments; to show students that adaptations come with both benefits and costs.

Evaluation:

Seminar Quizzes (2)	10%
Mid-term Exams (2):	40%
Research Papers:	10%
Final Examination:	40%

At the end of this course you will be assigned a letter grade. These letter grades correspond to percentages in the following way:

90-100 =	A+	67-69 =	C+
85-89 =	A	64-66 =	C
80-84 =	A-	60-63 =	C-
76-79 =	B+	55-59 =	D+
73-75 =	B	50-54 =	D
70-72 =	B-	0-49 =	F

TOPIC OUTLINE:**1. Introduction to Physiology – Chp 1**

- A. What is physiology?
- B. Unifying themes in physiology
 - physiological regulation
 - phenotype, genotype, environment
 - physiology and evolution

2. Overview of Enzyme Kinetics and Cellular Metabolism – Chp 2

- A. Metabolism – general
- B. Enzymes
 - enzyme kinetics [zero order, 1st order, 2nd order reactions]
 - substrate affinity
 - K_m , V_{max} , Michaelis-Menton & Lineweaver-Burk equations
 - mechanisms of enzyme control [competitive, non-competitive and allosteric inhibition]
- C. Energy carriers [energy-rich phosphates, nucleotides]
- D. Aerobic and anaerobic metabolic pathways – a review

3. Thermal Physiology – Chp 13

- A. Laws of Thermodynamics
- B. Heat fluxes – conduction, convection, radiation
- C. Temperature preference, tolerance, resistance
- D. Ectotherms, endotherms, heterotherm
 - 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

MID-TERM EXAMINATION 1 (20%)

4. Circulation – Chp 8

- A. Need for vascular systems
- B. Components of circulatory systems
- C. Diversity of circulatory systems
- D. Circulatory system 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
- H. Blood

5. Respiration - Chp 9

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

MID-TERM EXAMINATION II (20%)

6. Excretory System – Chp 10

- A. Functions of the excretory system
- B. Strategies for osmoregulation
- C. Role of epithelial tissue
- D. Nitrogen excretion
- E. The mammalian kidney

7. Osmoregulation – Chp 10

- A. Intracellular fluid (ICF) versus extracellular fluid (ECF)
- B. Osmoconformers versus osmoregulators

- C. Survey of osmoregulation in major animal phyla
- D. Hyperosmotic regulation (eg, freshwater bony fishes)
- E. Hypo-osmotic regulation (eg, marine vertebrates)
- F. Osmotic balance in mammals
- G. Regulation of pH

8. Acquiring Energy: Feeding, Digestion and Metabolism – Chp 15

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

FINAL EXAMINATION (Cumulative)