

University of Arkansas – Fort Smith
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General Syllabus:

BIOL 3814 Animal Physiology

Credit Hours: 4

Lecture Hours: 3

Laboratory Hours: 3

Prerequisite: BIOL 2703/2701 General Zoology/Laboratory, BIOL 3803/3801 Genetics/Laboratory, and CHEM 2703/2701 Organic Chemistry I/Laboratory.

Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description

An introduction to animal structure and function. Basic mechanisms of physiology related to major systems will be covered including neurobiology, endocrinology, movement, circulation, gas exchange, digestion, and ionic and osmotic balance. A comparative approach emphasizing how physiological differences among animal species have evolved based upon the need for the animal to adapt to the environment.

II. Student Learning Outcomes

A. Subject Matter

Upon successful completion of this course, the student will be able to:

1. Describe the various physiological organ-systems and their importance to the integrative functions in animals.
2. Describe body fluid compartments and the ionic composition of body fluids and movement between compartments.
3. Explain the concept of homeostasis, including set point, negative and positive feedback loops, and compensatory responses.
4. Explain the function of biological membranes including the role of membrane proteins in catalysis, recognition, and transport.
5. Analyze intracellular and extracellular communication systems.
6. Compare and contrast the nervous systems of various animal groups, including the central and peripheral nervous systems, the autonomic nervous system, and the enteric nervous system.
7. Explain the ionic basis of membrane potentials.
8. Describe and predict action potential, action potential propagation along the axon, and synaptic transmission.

9. Describe chemical messenger molecules including neurotransmitter, hormones, and other signals.
10. Describe the basic principles of sensory physiology.
11. Describe the structure and function of skeletal muscle, including excitation-contraction coupling, sliding filament mechanism, force generation, and relaxation.
12. Compare and contrast the structure and functions of the cardiovascular system of various animal groups, including the mechanical and electrical properties of cardiac muscle function.
13. Describe the factors that influence blood pressure.
14. Compare and contrast the structure and functions of the respiratory systems of various animals groups, including respiratory structures, lung volumes, gas exchange, and gas transport in blood.
15. Describe the structure and functions of smooth muscle, including excitation-contraction coupling in smooth muscle.
16. Analyze hormone action, including structure, mechanism of release from endocrine cell, mode of transport in blood, mechanism of action in target cells, and systemic effects of important hormones.
17. Predict the functions of the endocrine system with focus on classic endocrine glands, including the hypothalamus and the pituitary glands, thyroid and parathyroid glands, adrenal glands, endocrine pancreas.
18. Compare and contrast the structure and functions of the kidney nephrons in different animal groups, including glomerular filtration, tubular reabsorption, tubular secretion, and excretion.
19. Describe the maintenance of acid-base balance.
20. Describe motility, secretion, digestion, absorption in the gastrointestinal system.

B. University Learning Outcomes

This course enhances student abilities in the following areas:

Analytical Skills

Quantitative Reasoning: Students will identify and compare various physiological strategies for various major animal groups to survive in diverse habitats. Students will apply mathematical and statistical models to the study of animal physiology and demonstrate how quantitative reasoning may be used to test hypotheses in the application of scientific method.

Ethical Decision Making

The students will identify ethical considerations during discussions of ecosystem modifications that can influence physiological processes induced by human activities.

III. Major Course Topics

- A. Physiological Fundamentals
 1. Enzymatic regulation of cellular activity
 2. Cell-to-cell communication

3. Membrane transport mechanisms
 4. Modulation of signal pathways
 5. Homeostatic mechanisms
 6. Sources of cellular energy
- B. Neural/Endocrine Control
1. Signal molecules
 2. Differences between neural and endocrine regulation of homeostasis
 3. Evolution of nervous control in animals
- C. Neurons & Synapses
1. Membrane potentials
 2. Synaptic transmission
 3. Synaptic response and modulation
- D. Sensory Processes
1. Receptor cells and signal transduction
 2. Sensory modalities in different animals and the physiology of those senses
- E. Endocrinology
1. Synthesis, storage, and release of hormones
 2. Types of endocrine cells and glands and their activity
 3. Endocrine control of metabolism by energy availability
- F. Muscle & Movement
1. Control of movement
 2. Excitation-contraction coupling
 3. Muscle energetics
 4. Comparisons of skeletal, smooth, and cardiac muscles
- G. Respiration and Respiratory System
1. Properties and diffusion of gases
 2. External and internal respiration
 3. Types of breathing by major groups of vertebrates
- H. Circulatory Systems
1. Respiratory gas transport
 2. Acid-base regulation
 3. Principles of pressure, resistance, and flow of blood
 4. Circulation patterns in various groups of animals
- I. Osmoregulation
1. Relationships among body fluids
 2. Organs of blood regulation
 3. Osmolarity and tonicity
 4. Regulation of electrolytes and body fluids in various environments
 5. Mechanisms of excretion in major groups of animals
 6. Nephron structure and function including filtration, reabsorption and secretion.
- J. Digestion
1. Types of feeding
 2. Digestion and absorption in various animal groups