

LIFS 3040: ANIMAL PHYSIOLOGY

COURSE SCHEDULE: SPRING TERM 2022

COURSE INSTRUCTORS
Prof. Andrew L. Miller (ALM)*
Prof. Pingbo Huang (PBH)
 *Course Director

Time: Monday 3:00 pm – 4:20 pm and Friday 10:30 – 11:50.
Location: LTJ

Course description

Structure and life processes in animals; neurophysiology; circulation; respiration; digestion and absorption; metabolism and energy regulation; muscle and movement; endocrinology.

Objectives/ILOs

On completion of this course, students will:

1. Be able to understand the general principles of animal physiology to:
 - a. Explain how animals “work” from a cellular to a whole organism level.
 - b. To extrapolate this to understanding how animals interact with their environment.
2. Be able to appreciate that the study of animal and human physiology form the basis for modern medicine, drug design, and healthy life-style choices.
3. Be able to apply a combination of chemistry, physics, and mathematics to formulate a quantitative appreciation of physiological phenomena, and thus be able to use this integrated understanding to evaluate complex biological phenomenon.
4. Develop a sound understanding of how the major organ systems of an animal function, and how they work together in an integrated manner to support animal life on planet Earth.
5. Appreciate the importance of how the environment and human activities impact on the physiology of living systems, and thus understand why they are susceptible to the influence of abiotic factors as well as anthropological pressures.
6. Develop an understanding of how human physiological plays an essential role in defining what makes us essentially human: These include factors such as consciousness; awareness; intellect; memory; learning; perception; language; and thought.

Recommended Text: "Animal Physiology - Mechanisms and Adaptations" 5th Edition by Eckert, Randall, Burggren and French. W.H. Freeman & Co. ISBN 0-7167-3863-5

Week	Date	Lecturer	Subject
1	4/2 (Fri)	ALM	An Introduction to Animal Physiology.

Module I: Muscle and Movement (Chapter 10)

1	7/2 (Mon)	ALM	a. Structural basis of contraction.
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2/8/2022 (ALM)

- b. Sliding filament theory.
- c. Cross-bridge function and the generation of force.

1	11/2 (Fri)	ALM	d. Role of Ca ²⁺ in contraction. e. Electromechanical coupling. f. Mechanical properties of contracting muscle.
2	14/2 (Mon)	ALM	g. Neural control of contraction. h. Modulation of muscle contraction. i. Cardiac muscle. j. Smooth muscle. k. Sources of energy.

End of Module I

Module II: The Heart & Circulation of the Blood (Chapter 12)

2	18/2 (Fri)	ALM	a. Introduction to the cardiovascular system (CVS). b. General plan of the circulatory system.
3	21/2 (Mon)	ALM	c. Functional morphology of the mammalian heart. d. Electrical activities of the heart. e. The ECG and impulse conduction.
3	25/2 (Fri)	ALM	f. Excitation and contraction coupling in cardiac muscle. g. Neural control of the heart. h. Cardiac cycles – the heart as a pump.

End of Module II

Week	Date	Lecturer	Subject
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Module III: The Lungs and Exchange of Gases (Chapter 13)

4	28/3 (Mon)	ALM	a. Structure of the respiratory tract. b. The mechanics of breathing.
4	4/3 (Fri)	ALM	c. Surface tension, surfactant, and lung compliance. d. Lung volumes and ventilation.

End of Module III

Module IV: The Kidney: Osmoregulation and Excretion (Chapter 14)

5	7/3 (Mon)	ALM	a. Introduction to homeostasis. b. Gross structure of the kidney. c. Fine structure of the kidney: the nephron.
5	11/3 (Fri)	ALM	d. Function of the nephron. e. Filtration: the renal corpuscle. f. Reabsorption and secretion.

6	14/3 (Mon)	ALM	g. Counter current mechanisms of the medulla. h. The loop of Henle. i. The vasa recta.
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End of Module IV

Week	Date	
6	18/3 (Fri)	MID-TERM EXAM (Only examined on Modules I to IV). Format: MC and Fill in the Blanks.

Week	Date	Lecturer	Subject
Module V: The Endocrine System (Chapter 9)			
7	21/3 (Mon)	PBH	a. General concepts of the endocrine system. b. The chemistry of hormones. c. Mechanisms of hormone actions.
7	25/3 (Fri)	PBH	d. Neuroendocrine system.
8	28/3 (Mon)	PBH	e. Metabolic and developmental hormones.
8	1/4 (Fri)	PBH	f. Hormones regulating water/electrolyte balance.
9	4/4 (Mon)	PBH	g. Reproductive hormones

Week	Date	Lecturer	Subject
Module VI: Digestion and Absorption (Chapter 15)			
9	8/4 (Fri)	PBH	a. Overview of the digestive system.
10	11/4 (Mon)	PBH	b. Digestion (Part I).
10	22/4 (Fri)	PBH	c. Digestion (Part II).
11	25/4 (Mon)	PBH	d. Absorption.

Module VII: Physiology of the Nervous and Sensory Systems (Chapters 5, 6 & 7)			
11	29/4 (Fri)	PBH	a. Structure and function of nerve cells and nervous systems.
12	6/5 (Mon)	PBH	b. Properties of sensory systems.

STUDY BREAK from 12th to 16th May 2022

EXAM PERIOD from 17th to 28th May 2022

(LIFS 3040 END OF TERM EXAM DATE to be announced)

END of TERM Exam will ONLY cover Modules V to VII.