

Animal Physiological Ecology (11:216:360)

Fall 2014

Mon. & Thurs. 12:35 – 1:55

Loree 020

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Office Hours: By appointment.

Course Description: Animal Physiological Ecology is a course about animal function – about “how animals work”. It is basically a physiology course, taught from an ecological and evolutionary perspective. Perhaps a better title would be “Ecological and Evolutionary Animal Physiology”. The course will incorporate the following themes into physiological topics: comparative, ecological, environmental, evolutionary, integrative, and organismal. It will to some extent address molecular and cellular mechanisms, but it will mainly emphasize the organismal, ecological, and evolutionary significance of physiological function.

Animal Physiological Ecology is for students with strong preparation in general biology, including at a minimum successful completion of General Biology (115, 116, and 117 or equivalent) in good standing. The course is open to sophomores through seniors, but it should be viewed as an upper-level course most appropriate for juniors and seniors. The presentation of the course will assume that students recall and understand basic biological principles. Some knowledge of mathematics, chemistry and physics will be helpful at times. It will be assumed that students know where to turn to refresh themselves on fundamental biological topics that may have become foggy. Chapters 2, 4, and 5 in the required textbook (see below) are good sources of these topics.

Animal Physiological Ecology will serve primarily as the essential physiology course for students in biological sciences and related fields whose interests are in the broad areas of animal physiology, ecology, and evolution. This course will help in preparation for GREs, MCATs, and other graduate admissions exams. Students who are keenly interested in a human-oriented physiology course should consider taking Systems Physiology (146:356) and its associated laboratory instead of (or in addition to) Animal Physiological Ecology.

Basic topics covered in Animal Physiological Ecology will overlap many of those covered in Systems Physiology (146:356). For example, both courses cover Integrating Systems (nervous system, endocrine system), Movement and Muscle (nervous system, musculoskeletal system), Oxygen, Carbon Dioxide, and Internal Transport (cardiovascular system, respiratory system), Water, Salts, and Excretions (excretory system including kidneys), and Food and Energy (gastrointestinal system, endocrine system). However, Animal Physiological Ecology, in contrast to Systems Physiology, takes a more holistic and less mechanistic approach to these topics, emphasizing how animals work and succeed in the face of environmental challenges. In addition, and

partly because of the comparative nature of the course material, Animal Physiological Ecology covers several fundamental organizing principles of biological systems not covered in Systems Physiology, including phylogeny, body size, energetics, and temperature relations. Thus, the content of Animal Physiological Ecology will complement and supplement but not duplicate the material covered in Systems Physiology. Despite the overlap in content, Animal Physiological Ecology is distinct from Systems Physiology; students with a keen interest in physiology should consider taking both courses.

Course Learning Goals:

In brief, Animal Physiological Ecology has three broad objectives:

- 1) To understand the diversity of life, with a particular focus on physiological functions that allow animals to live and thrive in environments ranging from hot, wet and tropical to cold and arid, from terrestrial to aquatic, from marine to freshwater;
- 2) To understand the breadth of the discipline of physiology and the importance of integrating physiology with ecology and behavior, and with cellular and molecular biology;
- 3) To understand that nothing in biology makes sense outside the context of evolution; that evolution is the organizing principle of biology; that evolution is the 'fabric' of biology, the unifying theme of all of biology.

Required Textbook:

Hill, Wyse, and Anderson, 2012. *Animal Physiology*, 3rd edition (Sinauer). (An acceptable alternative is Hill, Wyse, and Anderson, 2008. *Animal Physiology*, 2nd edition (Sinauer).)

Supplemental readings will be posted as PDF files on the class Sakai site.

I expect you to read relevant sections of the textbook and supplemental readings. The textbook is an outstanding source of information and references. Questions on examinations will be taken from material covered in lectures, but you should use the textbook to reinforce topics discussed in lectures. Without any doubt, you will enhance your performance on examinations by studying pertinent sections of textbooks. The textbook includes some chapters and some sections of chapters that will not be covered directly in lectures. These sections will not be covered on exams. I will try to provide specific pages pertinent to lectures as the semester unfolds.

Evaluation: Evaluation will be based on three multiple-choice examinations and two homework assignments totaling 50 points. Two hourly examinations will be given during the semester, and a partially comprehensive **final examination will be given during the final exam period on Tuesday December 16 from 12:00 PM to 3:00 PM.**

The hourly exams will each consist of 50 multiple choice questions, valued at 2 points apiece for a total of 100 points. The final exam will consist of 75 questions (150 points), 50 of which will cover material discussed after the second mid-term

exam and 25 of which will cover material discussed for the 1st and 2nd exams. The homework assignments will have a total value of 50 points.

FINAL EXAM: TUESDAY, DECEMBER 16 – 12:00 TO 3:00 PM
Early departure for the winter recess will NOT be accepted as a valid reason to miss the scheduled final examination, which is scheduled on Tuesday, December 16, 2014 from 12:00 to 3:00 PM.

Grading Scale: Final grades will be based on a total of 400 points (350 examination points and 50 homework points). Final grades will be assigned on a “curve” based on the overall performance of the class. For example, instead of requiring 90% of the total points to earn an “A”, 90% of the highest earned score might be adequate.

Course Policies and Procedures:

The best way to ensure that you earn the highest possible grade is to attend all lectures and to *think* about the information that is covered. It is important to take notes during the lectures, re-write your notes with guidance from pertinent readings as soon as possible after the lectures, read all of pertinent sections of the textbook and supplemental readings, and write an outline of all required and pertinent sections of the textbook and supplemental readings. It is helpful to discuss the lecture material with other students in the class, or to explain what you learned to a friend or family member. But most of all, it is important to *think* about the information that is covered. *People remember what they think about. The more you think about things, the more you remember about them. Thinking* is the key to success in this and every course.

Availability of PowerPoint slides: Some PowerPoint slides will be made available to registered students via the Sakai site. These slides may not be complete sets of slides used in lectures. In other words, some of the material for which you will be held responsible is likely to be made available only in lectures. Even if full sets of slides are provided on the Sakai site, it is important to remember that the slides alone cannot possibly substitute for attending lectures. You will not do your best unless you attend lectures regularly.

Attendance: Attending all lectures is expected, and required for optimal learning.

Absence from lecture: Attendance at all lectures is required to optimize your performance. You are on your honor to attend all lectures. Required attendance is for your benefit.

Absence from exams: You must notify me ahead of time if you will have to miss a regularly scheduled exam due to an official university function. Absence from an exam due to illness or other family emergency will be evaluated on a case-by-case basis and will normally require written documentation of the reason for the absence.

Not all absences will be excused. Absence due to a faulty alarm clock or traffic congestion will not be excused. This is New Jersey – the most densely populated state in the nation. Roads are typically crowded and frequently congested. You must always allow extra time for traffic when you drive. This is New Jersey!

Early departure for the winter recess will NOT be accepted as a valid reason to miss the scheduled final examination, which is scheduled on Tuesday, December 16, 2012 from 12:00 to 3:00 PM. If you know that your schedule will not permit you to attend the scheduled final examination on December 16, please drop the course so that another student may register.

Lecture Schedule, Topics, and Readings

DATE	TOPIC	READINGS*
September 4, 8	Introduction; The Physical Environment; Approaches to the Study of Physiology; Animals and Environments; Adaptation	“The Physical Environment” (Ch.1 in Cain’s <i>Ecology</i> ; posted on Saki site) Inside front cover, Chapter 1, and chapter 3, pages 67-75 in <i>Animal Physiology</i> textbook
September 11, 15, 18, 22	Food and Energy	Chapters 6 – 9 Review: Ch. 5
Sept. 25, 29	Thermal Relations	Chapter 10; Also Figure 2.3 and related text on page 34;
October 2	Integration of Food, Energy, and Temperature	Chapter 11
OCTOBER 6	FIRST HOURLY EXAMINATION	
October 9, 13, 16, 20	Integrating Systems: Nervous System and Endocrine Physiology	Chapters 12 - 16 Review: Ch. 2, pages 32-40, pages 58-65; Ch. 5, pages 101-108
October 23	Reproduction	Chapter 17
October 27, 30, Nov. 3	Movement and Muscle	Chapters 19-21
November 6	Oxygen and CO ₂ Physiology	Chapter 22
NOVEMBER 10	SECOND HOURLY EXAMINATION	
November 13, 17, 20, 24	Oxygen, Carbon Dioxide, Internal Transport (respiratory and cardiovascular)	Chapters 22-26
Nov. 25**, Dec. 1, 4, 8	Water, Salts, Excretion (volume regulation, ion regulation, osmoregulation, kidneys)	Chapters 27, 28, 29, 30 Review: Ch. 5 pages 117-124
DECEMBER 16	FINAL EXAMINATION	12:00 to 3:00 PM
<p>*Readings are from <i>Animal Physiology</i> by Hill, Wyse, and Anderson unless designated otherwise</p> <p>** Class will meet Tuesday, Nov. 25 (Thurs classes)</p>		