

# **BZ214: Vertebrate Biology**

## **Summer 2023**

### **Instructor: Dr. Shane Kanatous**

Office: Biology Building, Room 217

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**Office Hours:** 11:30-12:30 Tuesday, Thursday, and by appointment.

**Lecture Meeting Times:** Lectures will be presented in person 10:00 to 11:15 (Anatomy/Zoology W118) Mondays thru Thursday.

### **Teaching Assistant: Melissa Morado (Mel)**

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**Lab Meeting Times:** Tuesdays 1:30-4:20p and Thursdays 1:30-4:20p

### **Course objective**

To introduce second year students majoring in zoology or biological science to the evolution of the anatomical, morphological, physiological and ecological characteristics of vertebrate animals.

BZ214 will be a survey of the characteristics that make chordates important, interesting, and unique. This class will provide a firm foundation for advanced training in ichthyology, herpetology, ornithology, and mammalogy. This course will address the five core areas of knowledge; evolution, Structure and Function, Information flow exchange and storage, Pathways and transformation of energy, and systems, identified by the Department of Biology.

This class will be a challenge; to succeed; you will need to assimilate many new facts. You will need to acquire a basic understanding of numerous mechanisms and processes. We strongly suggest you join a study group and make flashcards with the numerous terms and characteristics you will need to know and understand.

### **Areas of competency and skill in disciplinary practice**

1. **Apply the process of science:** 1) interpret the conclusions drawn from data and current scientific literature
2. **Use quantitative reasoning:** Based on graphs showing the relationship between two variables (e.g. running speed, aerobic metabolic rate), interpret the meaning of the function and predict how the function differs in other species.

3. **Tap into the interdisciplinary nature of science:** Explain the different perspectives different fields of science (i.e. behavior, anatomy, geology, physiology, molecular biology) have in terms of vertebrate history.
4. **Communicate and Collaborate with Other Disciplines:** Explain and discuss the different perspectives different fields of science have in terms of vertebrate history. The objective is to be able to elaborate and share the concepts learned in Vertebrates with colleagues both inside and outside of your discipline.
5. **Understand the relationship between science and society:** Explain the differences between current views and timescales of conservation and environmental change versus geologic perspectives.
6. **Use situational skills:** Use dissections to learn the many characteristics that are shared and derived that classify and distinguish different organisms as vertebrates. Use preserved museum specimens and accompanying databases as research tools in vertebrates.
7. **Respect diversity, practice inclusion:** 1) Introduce the different viewpoints of vertebrate research across different cultures and fields of science. In addition, introduce the contributions of numerous different cultures to the understanding of vertebrates. 2) Introduce and discuss concepts associated with personal biases towards science and the need to respect diverse viewpoints and concepts.
8. **Write:** The writing competency and concept recognition will be tested by short answer format questions on quizzes and exams throughout the semester.
9. **Use a computer:** Explain how computational tools are used to address diverse questions about vertebrates (e.g. biomechanics of locomotion and feeding, phylogenetic history and rates of speciation and extinction, and historical losses and regains of traits over evolutionary time). Perform computer-visualization-enabled comparative analyses of 3D skull structure in vertebrates.

## **Required Materials**

1. **Vertebrate Life**, 11th edition, 2023 by F. Harvey Pough et al., Pearson, New Jersey, ISBN 978-1-60535-607-5
2. **The Dissection of Vertebrates**, 3rd edition by De luliis and Pulera, Academic Press, ISBN-978-0-12-410460-0
3. Dissection kits (with scalpel and scissors) and an old shirt or lab coat, etc. will be needed for the lab.

## **Canvas**

Registered students will have automatic access to the Canvas site. Prior to each class, we will post some figures to aid, but not replace in-class notetaking. A list of review topics will be provided following each lecture.

## **Grading**

Your final grade will be based on your performance on the lecture exams **and** laboratory exams. There will be 3 lecture exams worth 100 points each. In addition, there will be 4 lab quizzes worth 10 points each, 3 lab practical exams worth 40 points each, and 1 take-home assignment worth 50 points. 75 possible points can be distributed for lab attendance and 15 possible points can be distributed for lab maintenance and professionalism. The total number of points for this course will be 600.

Exams are 50% multiple choice questions, 25% true/false questions, and 25% short answer questions. These exams are meant to test your comprehension and synthesis of the information.

**Exams must be taken on the scheduled date.** Makeup exams will only be given to students with a University approved absence, which provide documented evidence. Makeup exams will be given at a time of the instructor's choosing. **If you miss an exam for any other legitimate reason, we will average the other exams to compute your final grade. If you miss more than one exam or the final exam, you will receive an incomplete.** If you miss a lecture exam for any unapproved reason, you will receive a score of zero on that exam. If you belong to any University-sponsored group, we must be informed of known conflicts with exams with a letter signed by an appropriate authority **by the beginning of the second week of classes.**

Cutoffs for A, B, C, and D grades will be 90, 80, 70, and 60% of the class point total, respectively. We are happy to discuss exam questions with you at any time. However, for scoring purposes, no exam scores will be changed after 7 days following the posting of exam scores and keys.

**We adhere to the Academic Integrity Policy of the Colorado State University General Catalog {Page 7} and the Student Conduct Code.**

Please note that attendance at the lecture exams and labs are required. If you do not show up for the first two labs of the semester, you will be dropped from this course.

**There will be no extra credit assignments for either the lecture or lab.**

## **Lecture and Readings**

Reading assignments should be completed prior to coming to lecture. Some supplemental reading will be provided in Canvas to provide interesting aspects and real-life applications of vertebrate biology.

<b>BZ214 Lecture Outline</b> <b>Lecturer: Dr. Kanatous</b>	
<b>Week 1: June 12-15</b>	
<b>Introduction to Comparative Anatomy and the Origin of Chordates</b>	
Intro and Comparative Anatomy as a tool	Chapters 1-2
Origin of Chordates/Vertebrates	Chapters 1-2
Early vertebrates	Chapter 3
<b>The Characteristics of Early Vertebrates</b>	
Jawless and jawed vertebrates	Chapter 3
<b>Week 2: June 19-22</b>	
Aquatic life characteristics	Chapter 4
<b>The Chondrichthyes</b>	
Sharks, skates, and rays	Chapter 6 and 7
<b>The Ray-Finned and Lobe-Finned Fishes</b>	
Bony fish and lobed fin fish	Chapter 8
Bony fish and lobed fin fish	Chapter 9

<b>Week 3: June 26-June 29</b>	
<b>Movement to Land</b>	
How animals evolved to live on land	Chapters 10
Characteristics for air-breathing	Chapter 12
<b>Characteristics of Early Tetrapods, Amphibians, and Turtles (Early Reptiles)</b>	
Origin of early tetrapods	Chapters 10
<b>June 29</b> <b>Exam 1 (100 points)</b>	
<b>Week 4: July 5-6</b>	
Amniotes/amphibians/Salamanders	Chapters 11
Living on Land	Chapters 12
Thermoregulation	Chapters 15 and 20
Synapsid and Sauropsids	Chapter 14
<b>Week 5: July 10-13</b>	
<b>Dinosaurs, Crocodilians and the Evolution of Birds</b>	
Turtles	Chapter 16
Ornithischian and Saurischian dinosaurs	Chapter 19
Ornithischian and Saurischian dinosaurs	Chapter 19
<b>Week 6: July 17-20</b>	
Pterosaurs, Dinosaurs, Crocodylians, and Birds	Chapter 18
Introduction to Birds	Chapter 21
Avian Specializations	Chapter 21 and 22
Physics of Flight	Chapter 21 and 22
<b>July 20</b> <b>Exam 2 (100 pts)</b>	
<b>Week 7: July 24-27</b>	
<b>Mammalian Evolution</b>	
Early origins of mammals	Chapter 24
Mammalian Characteristics	Chapter 25
Mammalian Specialization	Chapter 25
Mammalian metabolism, digestion and reproduction	Chapter 25
<b>Week 8: July 31-August 3</b>	
<b>August 3</b> <b>Exam 3 (100 points)</b>	

### **Important information for students**

All students are directed to report any COVID-19 symptoms to the university immediately, as well as exposures or positive test results from a medical provider or home test.

- If you suspect you have symptoms, or if you know you have been exposed to a positive person or have tested positive for COVID (even with a home test), you are directed to fill out the [COVID Reporter](#).
- If you know or believe you have been exposed, including living with someone known to be COVID positive, or are symptomatic, it is important for the health of yourself and others that you complete the online [COVID Reporter](#). Do not ask your instructor to report for you.
- If you do not have internet access to fill out the online [COVID-19 Reporter](#), please call (970) 491-4600.
- You may also report concerns in your academic or living spaces regarding COVID exposures through the [COVID Reporter](#). You will not be penalized in any way for reporting.
- When you complete the [COVID Reporter](#) for any reason, the CSU Public Health Office is notified. Students who report symptoms or a positive antigen test through the COVID Reporter may be directed to get a PCR test through the CSU Health Network's medical services for students.

For the latest information about the university's COVID resources and information, please visit the CSU [COVID-19 site](#).

You will not be penalized in any way for reporting symptoms or concerns.

**Do not ask me as your instructor to report for you. It is your responsibility to report through the COVID Reporter promptly.**

**As your instructor I may not ask you about vaccination status or if you have COVID, but you may freely volunteer to send me information from a public health official if you have been asked to isolate or quarantine.**