



Division of Natural and Computational Sciences
Department of Biology
BIOL 4471 Comparative Anatomy of Vertebrates

College Mission

College is a Historically Black College founded in 1894, by the Colored Methodist Episcopal Church, now the Christian Methodist Episcopal Church (CME). Our mission continues to embody the principles of the Christian Methodist Episcopal Church. The College shall prepare students with competencies in critical and creative thinking related to the knowledge, skills, and abilities as defined in areas of study. Additionally, the College shall provide an environment to inspire intellectual, spiritual, ethical, moral, and social development, which empowers graduates to engage in life-long learning, leadership, and service.

Textbook

Vertebrates: comparative anatomy, function, evolution. K.V. Kardong, 8th edition, Washington State University, ISBN-13: 978-1260398564, ISBN-10: 1260398560
(other editions can be used without missing any information)

Required Readings/Resources:

Vertebrate Animals - Science Interactive Notebook - Classification & Taxonomy
(includes pre-drawn in color and black and white for all five categories of vertebrate animals)

The Atlas of Comparative Anatomy.

PDF version available: <https://dspace.sunyconnect.suny.edu/handle/1951/71276>

Subject: Anatomy/Physiology, Veterinary Science Material Type: Full Course Author: Kristen Roosa

eSkeletons

Type: Activity/LabDiagram/IllustrationInteractiveProvider:University of Texas at AustinAuthor:Dr. John KappelmanUniversity of Texas at Austin

Other Requirements:

Access to the internet and computer capable to run office and other software

Course Description

Comparative Anatomy course is designed to meet the requirements of Biology Major Students. The course deals with the anatomy of five classes of vertebrates, including fish, Amphibia, Reptiles, Birds, and Mammals. Comparative Vertebrate Anatomy examines the evolutionary history of vertebrate morphology with a primary focus on structure-function relationships.

Prerequisites: Biology 1 and 2

TEXAS COLLEGE OUTCOMES

1. Critical Thinking Skills
2. Communication Skills
3. Empirical and Quantitative Skills
4. Teamwork
5. Social Responsibility
6. Personal Responsibility

Furthermore, this course ensures the following institutional objectives:

1. Enhance communicative skills (oral and written)
2. Enhance critical thinking and technology skills.
3. Enhance leadership abilities and spiritual awareness.
4. Create opportunities for professional and pos-graduate pathways.

All learning objectives reflect the Texas College Core Values.

Academic Excellence: Developing a culture of curiosity and creativity that will challenge the frontiers of teaching/learning; stimulate research; raise the level of analytical reasoning and inquiry; and enable students to acquire leadership, human relations, communication, and technology skills.

Integrity: Instilling the pursuit of character, honesty, and sincerity of purpose as the moral rubrics upon which the behaviors of our graduates and College family are anchored.

Perseverance: Implanting diligence, enterprise, and pride in the application of skills, knowledge and abilities developed during the course of study at Texas College.

Social Responsibility: Promoting in the College community a conscious awareness that we are all stewards of the resources entrusted to our care.

Tolerance: Emphasizing openness to divergent points of view, applying an eclectic approach to rational and analytical thinking.

Community Service: Encouraging self-extension in service to others as the heart and soul of our educational enterprise.

STUDENT LEARNING OUTCOMES

When you have completed your study in this course you should be proficient in meeting the following objectives as described in the chart of weekly course schedule

	Assignment	Objectives	Due Date (Week)	Other activities

1	Introduction: Origin of Chordates	SLO1-SLO3, TC 1,3,4	I	Chose genes for lab assignment
2	Origin of Chordates	SLO1-SLO3, TC 1,3,4	II	Learn how to use GenBank
3	The Vertebrate Story	SLO1-SLO3, TC 1,3,4	III	Learn how to use UniprotKB
	Create cladogram for vertebrate classes using a gene of your interest	TC 2,4	I - III	Use BLAST to create a cladogram
	Test 1	SLO1-SLO3, TC 1,3,4		
4	Biological Design	SLO1, TC 1,3,4	IV	
5	Life History	SLO3, TC 1,3,4	V	
6	Integument	SLO1-SLO3, TC 1,3,4	VI	
	Create cladogram for vertebrate classes using a protein sequence of your interest			
7	Skeletal System: The Skull and The Axial Skeleton	SLO4, TC 1,3,4	VII	
	Learn how to use 3D modeling software, select the system or organs for 3D modeling.	TC 2, 4	IV-VII	
	Midterm exam	SLO1-SLO4, TC 1,3,4		
8	Skeletal System: The Appendicular Skeleton	SLO4, TC 1,3,4	VIII	
9	The Muscular System	SLO5, TC 1,3,4	IX	
10	The Respiratory System and The Circulatory System	SLO7, TC 1,3,4	X	
	Demonstrate first drafts of created 3D models and demonstrate that you know how to improve models further			

	Test 3	SLO1-SLO5, SLO7		
11	The Digestive System	SLO6, TC 1,3,4	XI	
12	The Urogenital System	SLO8, TC 1,3,4	XII	
13	Conclusions: Functional and Evolutionary Analysis	SLO1-SLO8, TC 1,3,4	XIII	
	Submit final 3D models	TC 2, 4	XI - XIII	
	Final exam	SLO1-SLO8		

Measurable Student Learning Outcomes (MSLO): To increase the student's familiarity with evolutionary phenomena and gain a conceptual understanding of the fundamental principles that describe the comparative anatomy. In addition, develop the ability to apply these principles to the analysis of simple biological systems.

Upon successful completion of this course the student will be able to demonstrate the following Benchmarks:

SLO1. To describe the different levels of organization in the anatomy of vertebrates, describe both the similarities and differences among the major groups of vertebrates;

SLO2. Apply the principles of comparative anatomy to situations encountered in everyday experience, to apply evolutionary theory to the relationships between vertebrates and demonstrate an understanding of the evolutionary history of vertebrates, including Natural Selection and the Classification of Life;

SLO3. Recognize and correctly use scientific and technical terminology used in comparative anatomy. Identify and describe the biological core concepts: evolution; structure and function; information flow, exchange and storage; pathways and transformations of energy and matter;

SLO4. Understand the vertebrate body plan and be able describe the skeleton of different classes of vertebrates.

SLO5. Describe the muscle system and its evolutionary changes in different classes of vertebrates.

SLO6. Describe the digestive system and its evolutionary changes in different classes of vertebrates.

SLO7. Describe the Respiratory and the Circulatory System and their evolutionary changes in different classes of vertebrates.

SLO8. Describe the urogenital system and its evolutionary changes in different classes of vertebrates.

Instructional Strategies:

- Inclass Discussion
- Inclass and Virtual Presentations
- Relevant videos

Student Activities:

- Participation
- Essay Questions
- Internet research
- Midterm and Final Exams
- Chapter Exams
- Laboratory Assignments

Method of Instruction:

- Web-based environment
- Class discussion to examine the topics on the course outline.
- Required readings and online activities.
- Use of online tools and resources to facilitate a deeper understanding of the readings and the class discussions.

Note: Designated time will be given to each student to discuss student progress. See your instructor for more information.

SOFTWARE AND SUPPLIES

Software and Programs:

1. Access to websites as referenced in class. *Students attempting to gain access through cell phones, Mac books, or outdated equipment may experience difficulties with certain websites or videos. It is the student's responsibility to locate a computer lab with viable equipment.*

2. Access to JICS. *It is the student's responsibility to become familiar with JICS.*

3. Documents in this course will be in MS Word format. PowerPoints and pdf files will also be used. Three-dimensional modeling software Microsoft Paint 3D.

Student can have all these capabilities due to his own personal computer or other devices. Alternatively, student can use TC computer labs with all these capabilities.

4. *Students should be prepared to back up files on their own Flash Drive. Work should be saved more than once, as it is not the instructor's responsibility if technology issues suddenly occur and information is lost.*

COURSE REQUIREMENTS

SUBMISSION OF ASSIGNMENTS

All assignments must be submitted on time **in JICS. Submitting assignments through email is discouraged.** If **extenuating circumstances** prevent you from turning in an assignment, please contact the Instructor **before** the due date. Late work will be accepted without penalties **only if emergencies are documented** or Texas College is experiencing difficulties. Students are required to have access to internet that is JICS compatible.

Students are expected to submit assignments on the due date. If you submit an assignment late, you will receive 70% of the earned grade for the assignment. No excuses will be accepted, including difficulties with technology.

ATTENDANCE POLICY

The student is responsible for attending all lectures, seminars, laboratories, and field work for each registered class. A student will be permitted one unexcused absence per credit hour of the course by the instructor in which he/she is enrolled. Any student whose unexcused absences exceed the number permitted by the instructor may be vulnerable to failing the course. The administration endorses student participation in activities and exercises that represent the college to the external publics. However, students are still responsible for the successful completion of coursework. Following are examples of excused absences and acceptable documentation considered by administration.

Excused Absences and the required documentation can be found on page 35 of the College Catalog. The Catalog can be found on the Texas College Website under the Office of Academic Affairs.

The student is responsible for attending all lectures, seminars, laboratories, and field work for each registered class—beginning with the first day of class scheduled—in order to verify registration with instructors and to complete all work assigned for the course. If a student does not attend class during the first week (first five instructional days) of the semester, or does not attend five consecutive class sessions, and does not give prior notification to the instructor of reasons for absence, and intent to attend the class, the student may be recommended to the Vice-President for Academic Affairs to be administratively withdrawn from the course. The instructor should read the rules governing class attendance and absences to each of the assigned classes at the beginning of each semester.

These attendance regulations will be strictly enforced.

The student will be held accountable for adhering to the College Attendance Policy. Instructors are not obligated to allow students to submit late assignments because of their absence unless the absences have been officially approved. An officially approved absence, however, gives the individual who missed the class an

opportunity to turn in the assignment late but in no way excuses the student from the work required. Official excuses are granted by the vice president for student affairs for authorized College activities, verified personal illness, or illness or death in the student's immediate family. Students should understand that absences may jeopardize their grades. A student will be permitted one unexcused absence per credit hour of the course in which he/she is enrolled. Any student whose unexcused absences exceed the number permitted may, at the discretion of the instructor, be assigned a grade of "F" or be dismissed from the class.

Absences will count from the first official date of classes and not from the first day the student attends. It is the responsibility of the instructor to keep an accurate attendance record of all students enrolled. Students receiving veterans' benefits are required to attend classes according to the regulations of the Veterans Administration in addition to those regulations set by the College for all students.

ACADEMIC HONESTY

Academic Integrity Policy:

Texas College believes that strength of character is as important as academic achievement, therefore, the College expects everyone in the academic community to maintain personal integrity in academic matters and not to contribute or condone the dishonesty of others. Scholastic dishonesty (which includes any form of plagiarism, cheating, falsification of records, and collusion with others to defraud) is improper and will not be tolerated. Texas College reserves the right to apply disciplinary actions to a

student who has committed scholastic dishonesty. For further information, see the *Texas College Catalog found on the Texas College website (www.texascollege.edu) page 33, Item: Academic Integrity Policy.*

COVID-19 REQUIREMENTS

COVID -19 Vaccination Policy:

Texas College, as a private, faith-based institution, strongly suggests that, effective for the Fall, 2021 term, all students, faculty and staff provide evidence that they have been fully vaccinated. Individuals who have religious beliefs, medical reasons, and/or philosophies (or are generally indifferent to taking the vaccination) will be required to provide and/or sign a statement to that effect, which they believe prohibits them from being fully vaccinated. This information is available at <https://www.texascollege.edu/covid-19> information/ as well as <https://www.texascollege.edu/fall-2021>.

INSTRUCTIONAL METHOD

Texas College observes **remote synchronous instruction** defined as a two-way, real-time/live, virtual instruction between instructors and students when students are not on campus and observing COVID-19 distance requirements.

In this method, the required amount of instructional time related to courses will be scheduled each day, and communication is generated when attendance is recorded daily at a locally selected time utilizing school-purchased Software. Synchronous instruction is provided through a computer or other electronic device or over the phone. The instructional method will address the course and degree program requirements. If a student who is originally scheduled to receive instruction through the on-campus or synchronous instructional method is not present at the designated official course time, the student will be not be considered present for the day by engaging through the remote synchronous method.

In the remote synchronous instructional method, student engagement is measured daily, and attendance is assigned based on the student's completion of that day's course engagement measure. Students who do not complete the daily measure of engagement are to be counted absent for that day, and that absence cannot be changed to remote synchronous present if the student completes the engagement measure on a later date.

Attendance is measured as synchronous interaction for scheduled courses. Attendance depends on the **active participation of students whether virtual (synchronous) or in class (non-synchronous)**. Students are expected to attend online sessions just as students will do in a face-to-face means of instruction. Appropriate lighting is encouraged for better engagement when the video feature of Zoom is in use.

PROGRAM FOR WHICH THE COURSE IS REQUIRED

Comparative anatomy of vertebrates is a requirement for Biology which leads to a Bachelor of Science (BS) Degree in Biology

METHOD OF STUDENT EVALUATION

Tests are typically composed of fill in the blank, short answer, and problems to be solved aimed at using critical thinking. Examinations are 100 points each.

Evaluation Components	% of Grade
Lecture	75
Classroom Assignments	
QEP Assignment 1 – Writing Assignment	
QEP Assignment 2 – Writing Assignment	
Chapter Examinations (test 1 and test 3)	
Midterm Examination	
Final Examination	
Laboratory	<u>25</u>
Total:	

QEP Assignment 1: consists of a five-paragraph essay. The first essay will be “Methods to determine the age of fossils.”

QEP Assignment 2: consists of a five-paragraph essay. The second essay will be “The molecular clock hypothesis. Using the molecular clock to determine evolutionary relationships.”

QEP Assignments will be found under JICS Coursework.

Grading Rubric:

A = 90-100	Transformative (and submitted on time)
B = 80-89	Proficient
C = 70-79	Developing
D = 60-69	Beginning
Below 60	Not Submitted on time

***Grade of C or above is required to pass the course. The course must be repeated for Biology Majors if grade is a D or below.**

Course Assignments-Lecture and Laboratory: (Assignments and their Due Dates on Posted on JICS Coursework).

Each student is expected to complete the assignments as specified. There will be No exceptions.

ASSESSMENT

Performance based standards for each learning opportunity will be explained prior to each assignment. Students will work toward successful attainment of all standards. The assessment is designed to require use of high level thinking skills and to provide authentic opportunities for students to demonstrate an understanding of effective classroom management. Assessment of the course objectives may include but is not limited to methods such as simulation, debate, and research.

Quick-writes/Reflections: Each class will begin with a writing assignment related to your reading. At the end of each class, students will also write reflections based on what was learned.

Missed assignment cannot be made up. This is a measure of your attendance, and participation, as well as your thinking skills.

SPECIAL NEEDS LEARNING

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of the Vice President for Academic Affairs at (903) 593-8311 x. 2335 for accommodations as early as possible in the term.

DIVERSITY STATEMENT

Texas College is committed to creating a community that affirms and welcomes persons from diverse backgrounds and experiences and supports the realization of their human potential. We recognize that there are differences among groups of people and individuals based on ethnicity, race, socioeconomic status, gender, exceptionalities, language, religion, sexual orientation, and geographical area. All persons are encouraged to respect the individual differences of others.

Caveat:

In the event of extenuating circumstances, the schedule and requirements for this course may be modified.

TECHNOLOGICAL STATEMENT

This course is infused with technology in order to:

- Participate in Courses Synchronously
- To provide access for course information
- Use the Internet and electronic databases to conduct searches for research projects
- Create multimedia presentations to present class projects to teachers and peers
- PowerPoint Presentations

WRITING ACROSS THE CURRICULUM

Strong communication skills are critical for professionals. In an effort to maintain a commitment to developing effective writing skills for all students, all writing assignments will be evaluated for overall communicative competence. The following will be considered when grading written assignments:

- Word-processed (12 font), double-spaced, one inch left, right, top and bottom margins
- Content
- Clarity and Organization
- Source(s)
- Depth of thought/Originality
- Technology and Delivery
- Grammar and mechanics

RESOURCES

Implementing fabrication as a pedagogical tool in vertebrate anatomy courses: motivation, inclusion, and lessons. KL Staab - Integrative and Comparative Biology, 2021 - academic.oup.com

Teaching Ichthyology Online with a Virtual Specimen Collection

Brian L. Sidlauskas; Michael D. Burns; Thaddaeus J. Buser; Nick Harper; Mark Kindred
Ichthyology & Herpetology (2021) 109 (2): 407–423.
<https://doi.org/10.1643/t2020031>

Using Skeleton Typograms to Explore Comparative Anatomy

C Hibbitt - The American Biology Teacher, 2020 - online.ucpress.edu

Birth of Homo erectus

B Wood - Evolutionary Anthropology: Issues, News, and Reviews 2020 - Wiley Online Library

The "Da Vinci" Biodiversity Park (Treviso, Italy). A didactic garden as innovative support to the teaching of science in secondary school

M Zanata, G Santovito - INTED2020 Proceedings, 2020 - researchgate.net

BIOLOGY PROFESSIONAL ORGANIZATIONS/ASSOCIATIONS

Professional Associations are a great source of information about internships, career pathways, conferences, scholarships, opportunities to meet people in your field, and a whole host of career-related topics. Usually associations will provide a discounted membership rate for students enrolled in college.

A few of these organizations include:

- [American Academy of Forensic Sciences](#)
- [American Association for the Advancement of Science](#)
- [American Institute of Biological Sciences](#)
- [The American Physiological Society](#)
- [American Society for Biochemistry and Molecular Biology](#)
- [American Society of Crime Laboratory Directors](#)
- [American Society for Human Genetics](#)
- [American Society for Microbiology](#)
- [Association for Women in Science](#)
- [The International Association for Science, Technology and Society](#)
- [National Academy of Science](#)

https://www.purdue.edu/science/careers/build_professional_profile/professional_orgs/bio_orgs.html