

BIOL 4505 Comparative Animal Physiology

Fall 2026 M W F 12:20 – 1:10 pm

Location: Life Sciences Complex A Room 204

Instructor: Dr. Dane A Crossley II

Office: Biology B214 Office Hours: Monday 11:00 am or by appointment

Phone: (940) 369-7627 Email: dane.crossley@unt.edu

Course Description:

The course is designed to provide students with a fundamental understanding of how the organ systems of diverse organism function. Topics include: 1) chemical structure and function as it relates to biology, 2) structure and function of cells and their components, 3) organ system function, 4) cellular mechanisms that underlie function.

Course Objectives

Students should be able to use critical thinking skills in applying biological knowledge to solve problems. An important point, you need to know the details of all aspects of material we cover. **All material discussed will be used to construct the exams which will be the assessments of your knowledge of the following topics:**

1. Review of basic chemistry, anatomy, physiology and physics laws that affect organism function. We will emphasize the concept that form is coupled to function. Basic aspects of homeostasis, positive, and negative feedback systems.
2. Explain and engage in conversations about cellular biochemistry and cellular transport systems.
3. Explain and describe the basic classifications of signaling molecules, the features of the endocrine system and the details of function of key endocrine cascades.
4. Explain and discuss the classification and anatomy of nervous tissue. Understand the equations used to calculate key aspects of cellular and neuron function. Understand cellular membrane potentials, action potentials and graded potentials. Finally discuss the function of the synapse.
5. Explain and discuss the anatomy of muscle types, the anatomy of striated muscle fibers and the sarcomere. Provide the cellular details of the sliding filament model and excitation contraction coupling. Finally, outline skeletal muscle fiber type differences.
6. Explain and discuss the sensory systems and detail key sensory systems including hearing, vision, taste, touch and olfaction.
7. Explain and discuss the anatomy of the cardiovascular system including its function. Outline the differences in the cardiovascular system in vertebrates. Explain the physical properties that dictate cardiovascular function as well as the physical principles that play roles in its function. Explain excitation contraction coupling of cardiac tissue. This will include outlining function at the organ system level down to the cellular level.
8. Explain and discuss the anatomical differences in the ventilatory organs in vertebrates. Discuss the two respiratory media. Discuss the physical gas laws and how they impact gas exchange. Explain the function of hemoglobin and the

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transport of CO₂ in the blood. Finally, discuss the mechanism of ventilatory control.

9. Revisit the process of diffusion. Explain the key mechanisms of ion and water balance in vertebrates. Explain the details of nephron function and outline the key cellular mechanisms involved in osmoregulation.
10. Explain the basic anatomy of the digestive system of vertebrates. Discuss the specifics of digestion in vertebrates and the specialization of the digestive processes in each digestive organ including the function at the cellular level. Discuss the mechanism of digestive system regulation.
11. Explain the different thermoregulatory strategies in vertebrates. Discuss the differences between ectothermic and endothermic vertebrates.

Course Requirements:

Text: Animal Physiology; By Richard W. Hill, Margaret Anderson, Gordon A. Wyse 5th edition.

Lecture Outlines:

Prior to each lecture an outline for the topics to be covered will be posted on Canvas under the files link. **Please keep in mind these are outlines, not notes.** Each outline will be made after a section is completed. They consist of bullet points or figures that we will discuss. The goal is to encourage you to attend class and interact during the class period and take notes during class. Outlines will not be posted early.

Points In the Class

Exams: There will be **4 exams** (three lecture exams and a noncomprehensive final exam each worth 100 points). If you are absent on an exam date due to a university sanctioned event, you will be excused from the exam. **There are no make-up exams in this class.** Exams will be based on material presented in lecture and discussions during each class period. You must be on time (not late) to take an exam.

Quizzes: Twelve 10-point quizzes will be given during the course. These will be multiple-choice quizzes and will be administered on Canvas. They will cover material presented in lecture. Your highest 10 scores will be counted toward your grade. The same criteria for missed exams will be followed for quizzes. Please be sure to take the quiz before it is due. **Quizzes will not be reopened or extended.** Please be sure you have reliable internet access before starting a quiz. These are assessment tools and are not intended to be study tools. Once you take the quiz it will be locked. **Please do not take photos of the quiz questions.**

Assignments: Six 15-point assignments will be due during the class. To complete these assignments, you will upload your notes taken in class to the assignment link. Submissions must be either **pictures of your handwritten notes** or if you are taking notes on a tablet, a copy of those written notes. Please submit them to the assignment link as PDF files. Each assignment must be signed and dated. The goal is to encourage you to take notes during the lecture and encourage you to attend class. Please **do not submit** material that is a copy of the outlines provided to you. No credit will be awarded for such submissions. **Use of AI to generate your notes is not allowed.**

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Notes Assignment I:	Primarily introduction and Background. Chemistry, Biochemistry and Cell Physiology. Cell Signaling and Endocrinology.
Notes Assignment II:	Neuron Structure and Function
Notes Assignment III:	Cellular Movement, Muscle Function and Sensory Systems.
Notes Assignment IV:	Circulatory Systems.
Notes Assignment V:	Ventilatory/Respiratory Systems.
Notes Assignment VI:	Ion and Water Balance. Digestion and Energy Metabolism. Thermal Physiology.

Total Points possible.

Quizzes	=	100
Assignments	=	90
Midterms	=	300
Final	=	100
		590

Grading: The final grade will be based on your point scores on the quizzes, midterm exams and the final.

Grading will follow:

- 541 pts is the minimum to earn an A,
- 472 pts is the minimum to earn a B,
- 413 pts is the minimum to earn a C, and
- 354 pts is the minimum to earn a D.

Federal regulations prohibit discussion of grades via phone or email.

Attendance and Participation Policy:

If you miss class you need to make sure you contact someone in the class to follow to discuss the topics that were covered during your absence. In the case of a missed exam due to participation in a UNT sponsored activity it must be approved in advance by the department chair and academic dean. Within three days after the absence, students must obtain authorized absence cards from the Dean of Students for presentation to their instructors. The only excused absences recognized by the University of North Texas are observation of religious holiday, military service or wherein a student is representing the university in an official capacity such as athletics or band. According to UNT policy: *"An activity or event is organized and sponsored by the university when it has been planned, funded and properly approved by the appropriate university official"*. Absence due to medical reasons **may be** excused but must be documented by a medical professional and **are determined on a case-by-case basis**. It is recommended that each student coordinate with a student colleague to obtain any missed notes to construct your own notes.

- Only students enrolled in the course are allowed to attend lectures.

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Conduct in the Classroom

Appropriate behavior is expected of all students taking this course. Cell phones should be turned off. **Texting during class is not appropriate and may result in a request that you leave the classroom.** Student behavior such as showing up late, that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable, disruptive and will not be tolerated. Students engaging in unacceptable behavior will be directed to leave the classroom and referred to the Center for Student Rights and Responsibilities.

• **Arrive to class promptly and do not leave until the instructor concludes the class.**

Disabilities Accommodation:

The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with an accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request accommodations at any time however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the Office of Disability Access website at <http://www.unt.edu/oda>. You may also contact them by phone at 940.565.4323.

Academic Integrity:

In this class, academic misconduct will automatically result in a failing grade.

The Department of Biological Sciences adheres to and enforces UNT's policy on academic integrity (cheating, plagiarism, forgery, fabrication, facilitating academic dishonesty and sabotage). Academic misconduct also includes the unacknowledged use of materials prepared by another person or agency in the distribution of academic materials. According to University policy, if you become aware of any misconduct related to academic integrity, you should inform me or another proper authority such as the department chair or associate dean. Failure to do so is considered academic misconduct. Students in this class should review the policy (UNT Policy Manual Section 18.1.16), online at http://policy.unt.edu/sites/default/files/untpolicy/pdf/7-Student_Affairs-Academic_Integrity.pdf. Violations of academic integrity in this course will be addressed in compliance with the penalties and procedures laid out in this policy.

The use of artificial intelligence applications, or AI, for any aspect of this course is not allowed. Please be aware of the University Policies.

UNT Copyright Compliance Policy (16.13.3)

Copyright Infringement: Anyone who makes unauthorized use of copyrighted material in a manner that violates the copyright owner's exclusive rights (except for narrowly defined exemptions) is committing copyright infringement and may be subject to civil and criminal

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penalties as well as disciplinary action by UNT. All materials generated for this course, which include but are not limited to syllabi, lectures and notes, quizzes, exams, in-class materials, review sheets, etc... are protected by copyright law. **You are prohibited from posting any of the material for this course online.** You do not have the right to copy and distribute the any course materials. You are authorized to take notes in class thereby creating a derivative work from my lecture, the authorization extends only to making one set of notes for your personal use and no other. You are not authorized to record lectures, to provide your notes to anyone else or to make any commercial use of them.

Anti-Piracy Warning: The unauthorized reproduction or distribution of copyrighted work is illegal. Criminal copyright infringement, including infringement without monetary gain, is investigated by the FBI and is punishable by up to five years in federal prison and a fine of \$250,000

- Unauthorized duplication, distribution or use of classroom training materials such as textbooks, PowerPoint presentations and any other learning materials provided.
- Unauthorized duplication, distribution or use of online training content, including computer software, online courses, skills assessments, sound or video recordings, training data and reports.
- Unauthorized duplication, distribution or use of web site content, including -authored articles and case histories, sound or video recordings, photos and graphics, etc.

Unauthorized Aids During Examinations and Assessments

Students may use only those materials and resources that are expressly authorized by the instructor for a particular examination or assessment. Touching, holding, or accessing any unauthorized aid during the examination period constitutes a violation of the Student Code of Conduct, regardless of whether the aid is used.

Any item that may be considered an unauthorized aid must be kept out of view and in a closed container (e.g. zipped backpack, buttoned purse, etc.) during the entirety of the examination or assessment.

Unless specifically authorized in writing by the instructor, prohibited aids include, but are not limited to:

- Mobile phones and smartphones
- Smartwatches and fitness trackers with communication, recording, or internet capabilities
- Tablets, laptops, and other computing devices
- Earbuds, headphones, and other audio devices
- Smart glasses, cameras, recording devices, and wearable technology
- Artificial intelligence (AI) tools, chatbots, and other generative AI technologies
- Notes, textbooks, study guides, formula sheets, or reference materials

Any other device, material, or resource not expressly permitted by the instructor

Students are responsible for clarifying any questions about permitted materials before the examination begins.

LECTURE: BOOK CHAPTERS, TOPICS AND EXAM SEQUENCE:

Quarters of the Course:

First Quarter Topics and Chapters Covered

Units 1 and 2. Primarily introduction and Background. Chapter 1 and 2

Unit 3. Chemistry, Biochemistry and Cell Physiology. Chapters 3-5

Notes Assignment I Due. 9-4-26

Unit 4. Cell Signaling and Endocrinology. Chapter 16

Review

Exam I 9-9-26

Second Quarter Topics and Chapters Covered

Unit 5. Neuron Structure and Function. Chapters 12 and 13.

Notes Assignment II Due. 9-21-26

Unit 6. Cellular Movement and Muscle Function. Chapters 19 and 20

Unit 7. Sensory Systems. Chapter 14

Notes Assignment III Due 10-5-26

Review

Exam II 10-7-26

Third Quarter Topics and Chapters Covered

Unit 9. Circulatory Systems. Chapter 25

Notes Assignment IV Due 10-16-26

Unit 10. Respiratory Systems Chapters 23 and 24

Notes Assignment V Due 10-28-26

Review

Exam III 11-4-26

Fourth Quarter Topics and Chapters Covered

Unit 11. Ion and Water Balance. Chapters 27-30

Unit 12. Digestion and Energy Metabolism. Chapters 6-9

Unit 13. Thermal Physiology. Chapter 10

Notes Assignment VI Due 12-2-26

Review

Final Exam 12-7-26 10:30-12:30