湖北工業大學
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Principles of Animal Physiology
Course Code	BIOL 3193
Semester	Summer 2026
Course Length	8 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite	BIOL 1101 Principles of Biology
Antirequisite	BIOL 3191 Principles of Animal Physiology (4 Weeks)

Course Description:

This course examines how animal bodies function at molecular, cellular, and systemic levels. We compare major vertebrate and invertebrate groups to understand physiological diversity and common constraints. Core topics include electrical signaling in neurons, chemical and hormonal communication, sensory detection of the environment, and the generation of movement by muscles. Additional emphasis is placed on energy metabolism, gas exchange, and temperature effects on animal performance.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical Thinking Skills** – Students will engage in analytical thinking, demonstrating the ability to critically evaluate, synthesize, and apply knowledge to complex problems, and construct well-reasoned solutions and arguments.
- **Independent Research and Inquiry** – Students will conduct independent research, utilizing academic resources to explore relevant topics, formulating research questions, analyzing data, and presenting findings in a coherent, scholarly manner.
- **Problem-Solving and Application** – Students will apply theoretical concepts and methodologies learned in the course to real-world problems, demonstrating the ability to develop practical solutions informed by academic inquiry.
- **Global and Cultural Awareness** – Students will gain awareness of the global and cultural contexts relevant to the course, appreciating diverse perspectives and considering the implications of their studies in a broader, international context.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Describe how ion gradients and membrane proteins generate resting and action potentials;
- Compare hormonal and neural control of homeostasis across taxa;
- Relate sensory receptor structure to stimulus modality and transduction mechanism;
- Calculate metabolic energy budgets and interpret trade-offs between aerobic and anaerobic pathways;
- Explain how temperature, oxygen availability, and nutrition shape physiological limits;
- Integrate multiple organ systems to explain whole-animal performance (e.g., locomotion, diving, thermoregulation).

Textbooks/Supplies/Materials/Equipment/ Technology or Technical Requirements:
Richard W. Hill; Gordon A. Wyse; Margaret Anderson (2016). *Animal Physiology (4th ed.).* Sinauer Associates.

Course Requirements:

Homework Assignments (20% total)
Four short assignments (5% each) distributed throughout the semester. These may include problem sets, short literature summaries, or data-analysis exercises that reinforce lecture topics.

Midterm Examination 1 (25%)
A written exam covering foundational concepts, nervous-system organization, and endocrine regulation. It consists of short-answer, diagram-based, and problem-solving questions that test conceptual understanding and application.

Midterm Examination 2 (25%)
A written exam focusing on sensory physiology, muscle function, and introductory energetics. It emphasizes comparative analysis and data interpretation through a mix of multiple-choice, labeling, and explanatory questions.

Final Examination (30%)
A comprehensive exam that covers the entire course with greater weight on later topics (muscle energetics, nutrition, and metabolic integration).

Assessments: Activity	**Percent Contribution**
Homework Assignments	20%
Midterm Examination 1	25%
Midterm Examination 2	25%
Final Examination	30%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	**Percentage of available points**

A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:
The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

BIOL 3193 Schedule

Lecture	Topics	Chapters
L1	Introduction: Levels of biological organization & homeostasis	1
L2	Cell signaling: Mechanisms of intercellular communication	2
L3	Membrane dynamics & solute transport (diffusion, osmosis, active transport)	5
L4	Resting membrane potential & passive electrical properties of neurons	12
L5	Action potential initiation, propagation, and refractory periods	12
L6	Synaptic transmission: Chemical vs electrical synapses	13
L7	Neurotransmitters, receptors (ionotropic & metabotropic), and synaptic plasticity	13
L8	Evolution of nervous systems: from nerve nets to cephalization	15
L9	Vertebrate CNS architecture & spinal coordination	15
L10	Peripheral nervous system: Somatic vs autonomic (sympathetic & parasympathetic)	15
L11	**Midterm Exam 1 (Lectures 1-10)**	-
L12	Principles of sensory transduction & coding	14
L13	Mechanoreception: Touch, proprioception, and hearing	14
L14	Photoreception: Eye anatomy, phototransduction, and vision	14
L15	General principles of endocrinology: Hormone classes, receptors, and feedback	16
L16	Hypothalamus-pituitary axis (HPA/HPT) and metabolic control	16
L17	Skeletal muscle structure, contraction (sliding filament), and excitation-contraction coupling	20
L18	Smooth & cardiac muscle mechanics; comparison with skeletal muscle	20
L19	**Midterm Exam 2 (Lectures 12-18)**	-
L20	Biomechanics of locomotion: Swimming, walking, running, flight; Reynolds number	19
L21	Aerobic vs anaerobic metabolism: Glycolysis, TCA cycle, ATP yields, and metabolic pathways	8
L22	Metabolic rate: Measurement, allometric scaling, BMR/SMR, and factors affecting metabolism	7
L23	Thermal biology: Ectothermy vs endothermy, thermoregulation,	10

	acclimation, and torpor/hibernation	
L24	Nutrition & digestion: Digestive strategies, nutrient absorption, and dietary requirements	6
L25	Integration & synthesis: Environmental stress, physiological adjustment, and case studies	11
Final Exam	Comprehensive (emphasis on lectures 19-25)	

Accommodation Statement:

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or outside the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations

All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates

All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work
The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs, and Disabilities
Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.