ANIMAL PHYSIOLOGY & ANATOMY (BIOAP)

BIOAP 1100 - Domestic Animal Biology (4 Credits)
This course introduces functional anatomy and physiology of livestock, companion animals and poultry. Building from biomolecules and cellular function to the entire organism, the content aims to integrate understanding of structure-function relationships offering comparisons between mammals and birds. Knowledge of systems physiology through this course will be relevant for pursuing basic and applied fields in animal science, biology and veterinary medicine. This course is suitable for life sciences majors.
Distribution Requirements: (BIO-AG, BSC-AG, OPHLS-AG), (BIO-AS)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Be able to appreciate the functional complexities of animal biology.
- Have comprehension of comparative anatomy of livestock and poultry.
- Have functional understanding of the major animal physiological systems.
- Be capable of integrating related topics from separate parts of the course and establish a coherent foundational knowledge network.
- Acquire potential for building on material learned as they advance through biology training.
- Be aware of the breadth of studies in biology and visualize career interests in animal biology.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 2140 - Sex Ed: Understanding Human Reproduction (3 Credits)
This course will examine human reproductive biology. Topics will address the structural, functional, and endocrine differences between the male and the female primarily as they relate to reproduction. Reproductive aberrations resulting in infertility and assisted reproductive technologies will be discussed. Additionally, non-reproductive differences including physical and behavioral differences will be considered.
Prerequisites: one year of introductory biology (or AP credit).
Last Four Terms Offered: Spring 2023, Spring 2022, Spring 2021, Spring 2020
Learning Outcomes:

- Describe the regulation of female and male human reproduction and relate course content to practical areas such as contraception and infertility.
- Acknowledge the intricate process of acquiring new scientific knowledge.
- Compare and critique biological and cultural influences on non-reproductive sex differences.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 3110 - Principles of Animal Physiology (3 Credits)
Crosslisted with VTBMS 3460, BIOMS 3110
General course in animal physiology emphasizing principles of operation, regulation, and integration common to a broad range of living systems from the cellular to the organismal level. Structure/function relationships are stressed along with underlying physico-chemical mechanisms.
Prerequisites: BIOG 1500 and BIOG 1440 or BIOG 1445 or one year of college biology, one year of chemistry and mathematics or equivalent AP credit.
Distribution Requirements: (BIO-AS), (BSC-AG, OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Students should be able to rationalize the operation of major organ systems.
- Students should understand the organization of multisystem regulatory loops.
- Students should be able to derive and understand the basic equations defining the physical operating characteristics of organ systems.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 3160 - Cellular Physiology (3 Credits)
Crosslisted with BIOMS 3160
A comprehensive course covering the general characteristics of eukaryotic cells; the structure, composition, and function of subcellular organelles; and the major signal transduction pathways regulating a variety of physiological cell activities. Among the main subjects covered are absorption and transport processes, mechanism of action of signaling molecules (hormones), the cell cycle and regulation of cell proliferation, cell-cell communication, extracellular matrix, stem cells, apoptosis, and carcinogenesis.
Prerequisites: BIOMG 1350 or previous or concurrent enrollment in BIOMG 3300, BIOMG 3310, BIOMG 3320, BIOMG 3330, or NS 3200.
Distribution Requirements: (BIO-AS), (BSC-AG, OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Recognize and describe cell biology structure and physiology to human diseases characterized by disruption of the normal functioning of these structures and molecular processes.
- Recognize and describe cell biology structure and physiology to the molecular mechanisms altered by clinically used pharmaceuticals.
- Recognize and describe cell biology structure and physiology to complex tissue functions, particularly with respect to stem cell and cancer biology.
- Discuss current research aimed at uncovering the underlying molecular processes, therapeutic targeting, and solving the current challenges for treating human diseases related to dysfunction cell biological structure and physiology, particularly with respect to cancer biology.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 3190 - Laboratory in Physiology (4 Credits)
Crosslisted with BIOMS 3190
Student-conducted in vitro and in vivo experiments designed to illustrate basic physiological processes, physiological research techniques, instrumentation, experimental design, and interpretation of results. Techniques include anesthesia, surgical procedures, dissection, and real-time computer recording and analysis. Experiments with isolated living tissues or live anesthetized animals examine properties of membranes and epithelia, blood, nerves, skeletal and smooth muscle; cardiovascular, respiratory, renal, and reproductive function and their regulation by the nervous and endocrine systems.
Prerequisites: Prerequisite or corequisite: BIOAP 3110.
Enrollment Information: Enrollment limited to: pre-med/pre-vet juniors, seniors, and graduate students interested in biomedical science.
Distribution Requirements: (BIO-AS), (BSC-AG, OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- After this course the student will be able to compute physical phenomena, including electrochemical gradients and mechanical forces in the physiology of live systems.
- After this course the student will be able to describe the scientific method including experimental design, formulating, and testing hypotheses.
- After this course the student will be able to work cooperatively in small groups.
- After this course the student will be able to communicate scientific concepts and experimental results in written and oral form.
- After this course the student will be able to use statistics to assess the significance of results.
- After this course the student will be able to research the published scientific findings and interpret them.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 3200 - Introduction to Veterinary Anatomy (4 Credits)
The aim of this course will be to give students an understanding of anatomy using the dog as a model system. Though this course is geared towards veterinary anatomy, it is relevant to human anatomy. It takes a regions-based approach to generating a map of the animal body and will be split into a lecture portion and lab portion where students will study anatomy in small groups using dog cadavers. By the end of the course, students will understand how different body systems function, how they fit together, and will understand the language of anatomy. Anatomy is the first course that students take in their first year of veterinary/medical school and students will learn the basics necessary to succeed in a graduate/professional level anatomy course.
Learning Outcomes:

- Diagram anatomical structures within a single body region in the dog and how those structures work together to form body systems demonstrating understanding of inter-relationships within and between anatomical regions.
- Competently dissect and identify anatomical structures on dog cadavers and in prosection material.
- Be able to use anatomical terminology fluently to describe where one structure is relative to another.
- Apply dog anatomical knowledge to explain broad evolutionary similarities and differences between canines and other animals commonly seen in veterinary practice (as well as humans when relevant).

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 3300 - Fish Physiology (3 Credits)
Crosslisted with ANSC 3300
Fish Physiology is an introduction to the functional biology of fish. Lecture topics will cover cellular and tissue function within key physiological systems that help fish thrive in a wide range of aquatic habitats, from mountain streams to deep-sea vents. These systems will be illustrated using a diverse variety of fish, while broader comparisons between fish and higher vertebrates will also be drawn. Discussion will integrate aquaculture, fisheries, and environmental contexts, including some of the anthropogenic challenges that fish face today and what can be done to mitigate them. Students will perform a gross dissection to identify anatomy in situ and visit an aquaculture facility (there is no separate lab section).
Prerequisites: one semester of introductory animal physiology (BIOAP 1100, BIOG 1440, BIOG 1445 or equivalent), or permission of instructor.
Distribution Requirements: (OPHLS-AG)
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Characterize various physiological systems that fish use to live in an aquatic environment.
- Describe how these systems adjust to environmental changes in the short and long term.
- Explain physiological differences between groups of fishes.
- Explain how physiological systems in fish may be similar to, differ from, or have evolved into those in terrestrial vertebrates.
- Discuss how unsustainable resource management and human perturbations in the environment affect fish at the physiological level.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 3410 - Biology of the Mammary Gland in Health and Disease (2 Credits)
Crosslisted with ANSC 3410
The course uses the mammary gland as the platform to illustrate the integration of physiological systems in the whole animal. Lectures cover the anatomy, development and endocrinology of the gland, composition and biosynthesis of milk and diseases related to mammary gland development and function. The information comes from a variety of mammals including the mouse for development, the dairy cow for production aspects and the human for diseases.
Prerequisites: BIOAP 1100 or introductory course in human or animal physiology.
Distribution Requirements: (OPHLS-AG)
Last Four Terms Offered: Spring 2024, Spring 2022, Spring 2020, Spring 2018
Learning Outcomes:
- List the major anatomical and physiological systems of the mammary gland and articulate how they support the fully functional gland.
- Describe the developmental and regulatory events leading to the formation of a fully functional mammary gland.
- Name the major components of milk and trace their synthesis to specific precursors and biochemical pathways.
- Explain the events leading to diseases associated with mammary development and lactation.
- Evaluate the scientific literature in one area of high interest to mammary gland biology and articulate deeper knowledge of this area through a research proposal.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 4130 - Histology: The Biology of the Tissues (4 Credits)
Crosslisted with BIOMS 4130
Provides students with a basis for understanding the microscopic, fine-structural, and functional organization of vertebrates (primarily mammals), as well as methods of analytic morphology at the cell and tissue levels. Emphasizes dynamic interrelations of structure, composition, and function in cells and tissues.
Prerequisites: BIOMG 1350.
Distribution Requirements: (BIO-AS), (BSC-AG, OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Recognize and describe the cells, tissues and organs of a mammalian body.
- Describe the connection between visual and functional aspect of each cell/tissue.
- Anatomically locate each tissue and organ in the body.
- Recognize the normal tissue as the basis to recognize how they change when affected by diseases (abnormal/pathological).
- Master the physiological complexity of body tissues.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 4140 - Principles of Pharmacology (3 Credits)
Crosslisted with BIOMS 4140, BIONB 4140
Undergraduate course surveying system- and organ-related aspects of pharmacology. Topics include mechanisms of drug action; drug disposition; pharmacokinetics; autonomic pharmacology; pharmacology of inflammation, allergy and platelet function; and endocrine, cardiovascular, respiratory, gastrointestinal, and renal pharmacology. The course is designed for undergraduate life science majors, particularly those interested in medical or veterinary school.
Prerequisites: BIOAP 3110 or NS 3410.
Distribution Requirements: (BIO-AS), (OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Describe fundamental concepts of drug-receptor interactions.
- Describe the relation between cell membrane or intracellular drug targets and intracellular signaling systems that mediate cellular response.
- Describe the impact of drug accessibility to biological compartments on drug action.
- Describe the purpose as well as the detailed mechanisms of the biochemical reactions that render drug and xenobiotic compounds more suitable for elimination from the body.
- Describe the fundamental mechanisms responsible for various types of drug interactions.
- Describe the mechanism of therapeutic action of a selected drug at the molecular, cellular, and organ system level.
- Describe the common adverse effects of a selected drug and their mechanism of production.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 4270 - Fundamentals of Endocrinology (3 Credits)
Crosslisted with ANSC 4270
Physiology and regulation of endocrine secretions. Emphasizes neuroendocrine, reproductive, growth, and metabolic aspects of endocrinology. Examples are selected from many animals, including humans.
Prerequisites: BIOAP 1100 or BIOG 1440, or permission of instructor.
Distribution Requirements: (BIO-AS), (OPHLS-AG)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Define the organization of the endocrine system with a focus on mammals.
- Explain the physiological function of major hormones and interactions among components of the endocrine system to control homeostasis.
- Describe the cellular source, biosynthesis, chemical nature, storage, factors controlling its secretion, cellular mechanisms of action on target cells, and physiological functions for each major hormone.
- Predict the consequences of disturbances in components of the endocrine system.
- Illustrate how basic scientific research as well as clinical studies of endocrine disorders contribute to the advancement of basic knowledge and development of therapeutic strategies for endocrine disorders.
- Appraise how the acquisition of knowledge about the endocrine system is ongoing and how key advances in technology from multiple fields (physiology, cell biology, biochemistry, and genetics) have promoted advancements in knowledge of the endocrine system.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 4980 - Teaching Experience (1-4 Credits)
Designed to give qualified undergraduate students teaching experience through actual involvement in planning and assisting in biology courses. This experience may include supervised participation in a discussion group, assisting in a biology laboratory, assisting in field biology, or tutoring.
Prerequisites: previous enrollment in course to be taught or equivalent.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BIOAP 5300 - Fish Physiology (3 Credits)
Crosslisted with ANSC 5300
Fish Physiology is an introduction to the functional biology of fish. Lecture topics will cover cellular and tissue function within key physiological systems that help fish thrive in a wide range of aquatic habitats, from mountain streams to deep-sea vents. These systems will be illustrated using a diverse variety of fish, while broader comparisons between fish and higher vertebrates will also be drawn. Discussion will integrate aquaculture, fisheries, and environmental contexts, including some of the anthropogenic challenges that fish face today and what can be done to mitigate them. Students will perform a gross dissection to identify anatomy in situ and visit an aquaculture facility (there is no separate lab section).
Prerequisites: one semester of introductory animal physiology (BIOAP 1100, BIOG 1440, BIOG 1445 or equivalent), or permission of instructor.
Exploratory Studies: (CU-SBY)

Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:
- Characterize various physiological systems that fish use to live in an aquatic environment.
- Describe how these systems adjust to environmental changes in the short and long term.
- Explain physiological differences between groups of fishes.
- Explain how physiological systems in fish may be similar to, differ from, or have evolved into those in terrestrial vertebrates.
- Discuss how unsustainable resource management and human perturbations in the environment affect fish at the physiological level.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 5410 - Biology of the Mammary Gland in Health and Disease (2 Credits)
Crosslisted with ANSC 5410
The course uses the mammary gland as the platform to illustrate the integration of physiological systems in the whole animal. Lectures cover the anatomy, development and endocrinology of the gland, composition and biosynthesis of milk and diseases related to mammary gland development and function. The information comes from a variety of mammals including the mouse for development, the dairy cow for production aspects and the human for diseases.
Prerequisites: BIOAP 1100 or introductory course in human or animal physiology.
Last Four Terms Offered: Spring 2024, Spring 2022
Learning Outcomes:
- List the major anatomical and physiological systems of the mammary gland and articulate how they support the fully functional gland.
- Describe the developmental and regulatory events leading to the formation of a fully functional mammary gland.
- Name the major components of milk and trace their synthesis to specific precursors and biochemical pathways.
- Explain the events leading to diseases associated with mammary development and lactation.
- Evaluate the scientific literature in one area of high interest to mammary gland biology and articulate deeper knowledge of this area through a poster presentation.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 6100 - By Scientific Design: Skill Building for a Career in the Life Sciences (3 Credits)
This class is designed to prepare first year graduate students for a career in the life sciences. Topics will include grant writing, public presentations, design of experiments, interpretation of data, and literature analysis. Students will also gain practical experience in common techniques used in virology, crystallography, and gene expression.
Enrollment Information: Enrollment limited to: graduate students in the Biomedical and Biological Sciences program. Other graduate students may attend with the consent of the instructor.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:
- Students will be able to formulate a properly controlled scientific study.
- Students will be able to present scientific data in public forums.
- Students will be able to critically assess scientific literature.
- Students will be able to develop a grant proposal.
- Students will be able to write a scientific abstract.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 6270 - Fundamentals of Endocrinology (3 Credits)
Crosslisted with ANSC 6270
Physiology and regulation of endocrine secretions. Emphasizes neuroendocrine, reproductive, growth, and metabolic aspects of endocrinology. Examples are selected from many animals, including humans.
Prerequisites: BIOAP 1100 or BIOG 1440, or permission of instructor.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Define the organization of the endocrine system with a focus on mammals.
- Explain the physiological function of major hormones and interactions among components of the endocrine system to control homeostasis.
- Describe the cellular source, biosynthesis, chemical nature, storage, factors controlling its secretion, cellular mechanisms of action on target cells, and physiological functions for each major hormone.
- Predict the consequences of disturbances in components of the endocrine system.
- Illustrate how basic scientific research as well as clinical studies of endocrine disorders contribute to the advancement of basic knowledge and development of therapeutic strategies for endocrine disorders.
- Appraise how the acquisition of knowledge about the endocrine system is ongoing and how key advances in technology from multiple fields (physiology, cell biology, biochemistry, and genetics) have promoted advancements in knowledge of the endocrine system.

Schedule of Classes (https://classes.cornell.edu/)

BIOAP 7100 - By Scientific Design: Skill Building for a Career in the Life Sciences II (3 Credits)
A major goal in biomedical research is to translate advances in basic science into practically useful applications in clinical medicine. This class will provide graduate students with exposure to basic and clinical research, training in critical evaluation of the literature, foster creative thinking, and provide practice in oral defense.
Enrollment Information: Enrollment limited to: graduate students in the Biomedical and Biological Sciences program. Other graduate students may attend with the consent of the instructor.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Schedule of Classes (https://classes.cornell.edu/)

BIOAP 7570 - Current Concepts in Reproductive Biology (3 Credits)
Crosslisted with ANSC 7570
This course offers students who have already obtained fundamental knowledge in reproductive biology an opportunity to gain in-depth understanding of specific topics in reproductive science and technology. This course also aims to advance students' skill in critical thinking and assessing of literature, as well as in formulating hypotheses in emerging research areas of reproductive biology. Examples of topics covered in this course include central nervous system control of reproduction, gametogenesis, sex differentiation, ovarian biology, uterine function, placental biology, reproductive immunity and infertility.
Enrollment Information: Enrollment limited to: graduate students; senior undergraduate students may enroll with permission of instructor.
Last Four Terms Offered: Fall 2024, Fall 2022, Fall 2020, Fall 2017
Schedule of Classes (https://classes.cornell.edu/)