



MASTER COURSE OUTLINE

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COURSE TITLE

Majors Organismal Phys

GENERAL COURSE INFORMATION

Dept.: BIOL&

Course Num: 223

(Formerly: BIO 123)

CIP Code: 26.0101

Intent Code: 11

Program Code: N/A

Credits: 5

Total Contact Hrs Per Qtr.: 71.5

Lecture Hrs: 38.5

Lab Hrs: 33

Other Hrs: 0

Distribution Designation: Lab Science LS

COURSE DESCRIPTION (as it will appear in the catalog)

The third quarter in a three-quarter general biology series, this series is designed for life-science majors, pre-professional students, and for students intending to take advanced courses in the biological sciences. Topics of study include: animal and plant anatomy, physiology, and development. Related investigations take place in a three-hour lab period each week.

PREREQUISITES

Successful completion of BIOL& 222 with a 2.0 or better and successful completion of either CHEM& 121 or CHEM& 161 with a 2.0 or better, or instructor permission.

TEXTBOOK GUIDELINES

A recent edition of a majors' biology text such as *Biology* by Brooker, Widmaier, Graham, and Stilling, McGraw-Hill Higher Education. The text used must have departmental approval.

COURSE LEARNING OUTCOMES

Upon successful completion of the course, students should be able to demonstrate the following knowledge or skills:

1. Apply the scientific method to hypothetical biological problems; design valid experiments.
2. Describe and explain the principles and events of embryonic development including fertilization, cleavage, gastrulation, neurulation, organogenesis, and control of cell differentiation and morphogenesis.
3. Describe animal body organization including animal tissues, organs, and organ systems; describe and explain homeostasis in animals including homeostatic control strategies and systems.
4. Describe the cellular components of the nervous system and explain how neurons generate and transmit nerve impulses throughout nervous systems, and how neurons communicate electrically and chemically at the synapse.
5. Describe the different types of nervous systems found in animals and discuss the evolution of brain complexity; describe the structure and function of the vertebrate nervous system and its parts.
6. Describe, compare, and contrast the types of animal skeletons; specifically describe the vertebrate skeleton and the structure of bone. Further, describe the structure of muscle tissue, and explain muscle contraction, stimulation, and muscle function, as well as animal locomotion.

7. Describe and discuss the digestive systems of animals, especially vertebrate systems, including the mechanisms of digestion and absorption. Further discuss and explain nutrient use and storage, regulation of absorption, energy balance, and the regulation of body temperature.
8. Describe and explain animal circulatory systems comparing and contrasting open and closed systems as well as single, intermediate, and double systems in vertebrates; list and describe the components of blood and the structure and function of the vertebrate heart and vascular system.
9. Describe and explain the various types of respiratory systems; specifically describe the structure and explain the functioning of mammalian and avian respiratory systems and the mechanisms of oxygen transport in blood and ventilation.
10. Compare, contrast, and explain the different excretory systems of animals; describe the structure and explain the functioning of the mammalian kidney.
11. List and discuss the actions of animal hormones, especially the major human hormones; identify and categorize the types of hormones, describe the links between the endocrine and nervous systems, and explain hormonal control of metabolism and energy balance, mineral balance, growth and development, reproduction, and stress.
12. Describe and explain the animal immune system and immune response, including types of pathogens, innate immunity, the inflammatory response, acquired immunity, humoral immunity, and cell-mediated immunity.
13. Describe and explain the structure and functions of the vegetative plant organs: stems, roots, and leaves, including the structure and functions of meristems, tissues, and organ systems.
14. Describe plant behavior response, including cell signaling, plant hormones, responses to environmental stimuli, and environmental stress; name the major plant hormones and photoreceptors and describe their effects as well as the regulation of flowering (as time permits).
15. Explain the overall process of photosynthesis, outlining the steps involved in non-cyclic photophosphorylation and describing the chemical reactions that occur throughout the Calvin cycle.
16. List and discuss the nutrient needs of plants, describing soil makeup, nitrogen fixation, and biological sources of plant nutrients (as time permits).
17. Explain how water and dissolved food substances are transported throughout the plant including water potential, tissue-level transport, long-distance transport, and the regulation of stomatal opening/closing.

INSTITUTIONAL OUTCOMES

IO3 Human Relations/Workplace Skills: Students will be able to demonstrate teamwork, ethics, appropriate safety awareness and/or workplace specific skills.

COURSE CONTENT OUTLINE

1. Animals
 - Animal Development – Fertilization, Cleavage, Gastrulation, Neurulation, Organogenesis, and Control of Cell Differentiation
 - Animal Bodies and Homeostasis – Tissues, Homeostatic Control Strategies and Systems
 - Cells of the Nervous System – Nerve Impulse Generation and Transmission, Electrical and Chemical Synapses
 - Evolution, Structure, and Function of the Nervous System – Humans and Other Vertebrates
 - Muscular-Skeletal Systems and Locomotion – Animal Skeletons, Muscle Structure, Contraction, Stimulation, and Function
 - Nutrition and Animal Digestive Systems – Vertebrate Digestive System, Digestion, and Absorption
 - Control of Energy Balance, Metabolic Rate, and Body Temperature
 - Circulatory Systems – Vertebrate Systems, Blood Components, Vertebrate Heart, Vascular System
 - Respiratory Systems – Gas Properties, System Types, Mammalian and Avian Systems, Blood Oxygen Transport, Ventilation

Excretory Systems and Salt and Water Balance – Comparing Excretory Systems, Mammalian Kidney Structure and Function

Endocrine Systems – Hormone Type and Effect, Endocrine-Nervous System Links, Hormonal Control

Immune Systems – Pathogens, Innate and Acquired Immunity, Humoral and Cell-Mediated Immunity

2. Flowering Plants

Form and Function – Tissues, Organ Systems, Stems, Roots, Leaves, Adaptations

Behavior – Plant Hormones, Response to Environmental Stimuli, Regulation of Flowering

Photosynthesis – Events of Non-cyclic Photo-phosphorylation, Reactions of the Calvin Cycle

Nutrition – Nutrients, Soils, Soil Structure, Nitrogen Fixation, Biological Sources

Transport – Uptake and Movement at Cellular Level, Tissue-Level and Long-Distance Transport

DEPARTMENTAL GUIDELINES (*optional*)

- The overall course percentage will be based on the following weighted categories:
 - Lecture exams (including 2-4 tests plus a comprehensive final exam) collectively worth 60%,
 - Laboratory work collectively worth 25-30%, and
 - Class assignments/quizzes collectively worth 10-15% of the overall score.
- A standard grade scale will be used for this course with a 2.0 grade point corresponding to 70-72%.
- All exams are proctored. When possible, exams are held on campus. Online and hybrid courses may have exams online, but they must be proctored to ensure academic honesty.
- Lab is an essential part of this class and is required for credit. Students missing more than two labs will not be given credit for this course.
- PO5 should be assessed: Students will be able to solve problems by gathering, interpreting, combining and/or applying information from multiple sources.

DIVISION CHAIR APPROVAL

DATE