

BIOL 1B: FORM & FUNCTION IN PLANTS & ANIMALS

Foothill College Course Outline of Record

Heading	Value
Units:	6
Hours:	4 lecture, 6 laboratory per week (120 total per quarter)
Prerequisite:	BIOL 1A.
Advisory:	Students taking the biology majors' sequence (BIOL 1A, 1B, 1C, 1D) are strongly advised to take the sequence in its entirety.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Students will be able to communicate the results of scientific
- The student will compare and contrast the functioning of physiological systems in plants and animals.

Description

An introduction to the structure and physiological processes of plants and animals. Transport systems, reproduction, digestion, gas exchange, regulation of the internal environment, responses to external stimuli, nervous systems, hormones, and locomotion. Intended for biology majors.

Course Objectives

The student will be able to:

- identify and apply the steps of the scientific method to study a question.
- explain the interrelationship of structure and function in multicellular organisms.
- describe the hierarchy of tissues, organs, and organ systems.
- describe the basic anatomy and morphology of flowering plants.
- explain transport of water, minerals and organic compounds in vascular plants.
- explain how plants respond to external and internal stimuli, including plant growth regulators.
- describe the reproductive system of flowering plants.
- describe various animal organ systems with an emphasis on digestive, circulatory, respiratory, nervous, and excretory systems.
- compare and contrast the physiology of aquatic and terrestrial animals, especially with regards to the respiratory and excretory systems.
- explain mechanisms for homeostasis, including methods of thermoregulation and osmoregulation.
- describe the role of chemical coordination in animals.
- describe various animal skeletal systems and their role in locomotion.
- describe and explain muscle contraction; contrasting skeletal, smooth, and cardiac muscle.
- describe general patterns of animal reproduction and development.

- master basic laboratory techniques in plant and animal anatomy and physiology.
- explain experimental techniques and results orally and/or in writing.

Course Content

- Introduction
 - Levels of organization in multicellular organisms
 - Anatomy and physiology/structure and function
 - Tissues, tissue systems and organs in plants
 - Tissues, organs and organ systems in animals
- Biology of Plants
 - Plant anatomy and morphology
 - Cells and tissues
 - The root system
 - The shoot system
 - Primary and secondary growth of roots and shoots
 - Transport processes in plants
 - Review transport mechanisms
 - Water potential
 - Movement of water and minerals
 - Absorption in roots
 - Different routes
 - Casparian strip
 - Movement through xylem: Cohesion-tension theory
 - Control of transpiration
 - Movement of organic compounds (sugars): Pressure-flow hypothesis
 - Plant responses to internal and external signals, and the regulation of growth
 - Plant growth regulators (hormones) and their functions
 - Tropisms
 - Photoperiodism
 - Reproduction in flowering plants
 - Sexual reproduction
 - Alternation of generations
 - The flower
 - Structure
 - Pollination and fertilization
 - Mechanisms to promote outcrossing
 - The seed and fruit
 - Germination
 - Asexual reproduction
- Biology of Animals
 - Introduction to form and function in animals
 - Animal tissue types
 - Relationship between morphology and surface to volume ratio
 - Size
 - Shape
 - The internal environment
 - Negative and positive feedback control systems
 - Animal digestive systems
 - Feeding strategies
 - Enzymatic hydrolysis
 - Organs of digestive system and their roles
 - Types of digestive systems
 - Gastrovascular cavities
 - Alimentary canals
 - Comparison of herbivore, carnivore and omnivore adaptations
 - Circulation
 - Gastrovascular systems
 - Open circulatory systems
 - Closed circulatory systems

- 1) The heart
 - a) Comparative morphology of vertebrate hearts
 - b) Structure and function of the mammalian heart
- 2) Blood vessels
 - a) Structure
 - b) Fluid dynamics of blood flow
- 3) Blood
- 4) Lymphatic system
4. Gas exchange
 - a. General problems of gas exchange
 - 1) Comparison of diffusion in air and water
 - 2) Moist respiratory surfaces
 - 3) Comparison of oxygen and carbon dioxide diffusion
 - b. Animals that do not require respiratory systems
 - c. Aquatic respiration
 - 1) Gills
 - 2) Counter-current exchange
 - d. Terrestrial respiration
 - 1) Tracheal tubes - insects
 - 2) Lungs in mammals and birds
 - e. Oxygen transport
 - 1) Respiratory pigments
 - a) Hemoglobin
 - b) Myoglobin
 - c) Hemocyanin
 - 2) Oxygen dissociation curves
 - f. Carbon dioxide transport
5. The nervous system
 - a. Diversity of nervous systems
 - b. Vertebrate nervous system organization
 - c. The nerve impulse
 - d. The synapse
6. Homeostasis
 - a. Thermoregulation
 - 1) Mechanisms of heat gain and loss
 - 2) Ectothermy
 - 3) Endothermy
 - b. Osmoregulation
 - c. Nitrogenous waste excretion
 - 1) Comparison of ammonia, urea, and uric acid
 - 2) Invertebrate excretory organs
 - 3) The vertebrate kidney
 - a) Anatomy and physiology
 - b) Adaptations for water conservation
 - c) Regulation of kidney function
7. Chemical coordination
 - a. Selected endocrine glands and their products
 - b. Mechanisms of hormone action
 - c. Link between nervous and endocrine systems
 - 1) Hypothalamus
 - 2) Pituitary gland
8. Movement and locomotion
 - a. Skeletal systems
 - b. Muscle contraction
9. Reproduction and development
 - a. Vertebrate male and female anatomy
 - b. Hormonal regulation of gametogenesis
 - c. Embryology

Lab Content

- A. General lab skills

1. Application of scientific method
2. Presentation of experimental research results in oral, poster, and/or written format
3. Dissection
4. Microscopy
5. Elementary statistical analysis
- B. Plant form and function
 1. Cells and tissues
 2. Monocots versus dicots: anatomical and morphological differences
 3. Root, shoot and leaf anatomy and morphology
 4. Reproductive anatomy and morphology
 5. Angiosperm life cycle
 6. Plant growth
- C. Animal anatomy and morphology
 1. Histology
 2. Nervous system and brain anatomy
 3. Mammalian digestive system
 4. Mammalian cardiovascular system
 5. Mammalian excretory system
 6. Mammalian reproductive system
 7. Contrast mammalian and non-mammalian systems
 8. Comparative skeletal morphology
 9. Physiological data analysis

Special Facilities and/or Equipment

- A. Fully equipped biology laboratory and multimedia lecture room.
- B. Students need internet access.

Method(s) of Evaluation

- A. One or more midterm exam(s).
- B. Two or more practical lab exam(s).
- C. Quizzes.
- D. Written and/or oral presentation of experimental research results.
- E. Comprehensive final exam.
- F. Participation in the laboratory.

Method(s) of Instruction

- A. Lecture
- B. Cooperative learning exercises
- C. Oral presentations
- D. Laboratory

Representative Text(s) and Other Materials

REQUIRED:

Urry, Cain, Wasserman, Minorsky, and Reece. *Campbell Biology*. 11th ed. with MasteringBiology. San Francisco: Pearson/Benjamin Cummings, 2017. ISBN: 9780134082318

One of the following photo guides:

Rust, Thomas. *A Guide to Biology Lab*. 3rd ed. Boerne, TX: Southwest Educational Enterprises, 1983. ISBN: 9780937029015 (The photographs and labels in this guide are excellent. A newer edition is not available.)

Adams, B.J., and J.L. Crawley. *Van De Graaff's Photographic Atlas for the Biology Laboratory*. 7th ed. Englewood, CO: Morton Publishing, 2013. ISBN: 9781617310584

Schultheis, Lisa. Laboratory exercises. Los Altos Hills, CA: Foothill College, 2018. (The lab exercises are updated on a regular basis; author may vary based on which faculty member updated it most recently.)

RECOMMENDED:

Ambrose, H.W., K.P. Ambrose, D.J. Emlen, and K.L. Bright. A Handbook of Biological Investigation. Winston-Salem, NC: Hunter Textbooks Inc., 2007. ISBN: 9780887253317

Bohensky, Fred. Photo Manual and Dissection Guide of the Fetal Pig. Wayne, NJ: Avery Publishing Group, Inc., 2002. ISBN: 9780757000300 (Excellent photographs. This is the newest edition available.)

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Reading Assignments: Weekly reading assignments from college-level, lower division, biology majors text corresponding to lecture topics.

B. Laboratory Exercises: Biweekly lab exercises. Each lab exercise includes individual or group activities covering assigned readings in laboratory handouts.

C. Research Project: Students work in groups to design and implement a research project related to topics covered in lecture and/or lab. Results are presented in an oral presentation and/or a written research report.

Discipline(s)

Biological Sciences