

Lassen Community College Course Outline

BIOL-4 Principles of Evolutionary, Organismal and Ecological Biology

5.0 Units

I. Catalog Description

A course in principles of biology, with special emphasis given to evolution, organismal and ecological biology. Topics include evolution, classification, diversity of life; (unicellular and multicellular organisms); animal fungus and plant structure, development and function; and ecological relationships. This course is designed to meet the core requirements for biology and related majors. This course has been approved for hybrid (online/traditional) delivery.

Prerequisite: Math 60 Intermediate Algebra or equivalent multiple measure placement

Prerequisite Skills Required:

Before entering this course, the student should be able to:

Develop a systematic logical approach to solving a variety of problems Integrate mathematical computational and algebraic skills to solve and graph a variety of linear, exponential and logarithmic equations.

Recommended Preparation: Biology 1 Principles of Molecular and Cellular Biology

Transfers to both UC/CSU

CSU GE Area: B2 & B3

IGETC GE Area: 5B & 5C

General Education Area: A

C-ID BIOL 140

51 Hours Lecture, 102 Hours Expected Outside Class Work, 102 Hours Lab, 255 Total Student Learning Hours

Scheduled: Spring

II. Coding Information

Repeatability: Not Repeatable, Take 1 Time

Grading Option: Graded or Pass/No Pass

Credit Type: Credit - Degree Applicable

TOP Code: 040100

III. Course Objectives

A. Course Student Learning Outcomes

Upon completion of this course the student will be able to:

1. Apply the scientific method by stating a question; researching the topic; determining appropriate tests; performing tests; collecting, analyzing, and presenting data; and finally proposing new questions about the topic.
2. Construct a simple dichotomous key utilizing distinguishing characteristics to separate representative species from a variety of biological phyla within Domain Eukarya.
3. Explain the evolutionary progression of a process through a succession of increasingly more complex organisms.

4. Perform biological laboratory skills and display a habit of good laboratory practices.

B. Course Objectives

Upon completion of this course the student will be able to:

1. Describe the areas covered by: biology, zoology, botany, taxonomy, plant and animal anatomy, plant and animal physiology, evolution and ecology.
2. Describe the levels of organization (atomic-molecular through ecosystem and the biosphere).
3. Discuss characteristics of living organisms.
4. Apply the scientific method.
5. Discuss the observations leading Darwin and Wallace to development of the theory of evolution.
6. Describe the contemporary theory of evolution and provide modern evidence in support of the theory of evolution.
7. Discuss sources of change: mutation, recombination, unequal movement, genetic drift, and natural selection.
8. Perform Hardy Weinberg equations and how they are significant to population genetics.
9. Discuss factors causing deviations from the Hardy-Weinberg equilibrium.
10. Compare divergent and convergent evolution as well as stabilizing, selection, directional selection and disruptive selection.
11. Describe the scientific hierarchy for an organism.
12. Classify eukaryotic organisms based on their structure and reproduction.
13. Compare processes of reproduction and development in representative groups of organisms.
14. Identify the three primary germ layers and various tissues derived from each.
15. Describe Alternation of Generations and how it varies among the different plant groups.
16. Describe and discuss evolutionary advances in the reproductive cycle of a charophyte and the four major groups of plants.
17. Describe and discuss evolutionary advances in the reproductive cycles of animals
18. Differentiate between acoelomate, pseudo coelomate, and eucoelomate.
19. Identify, compare and contrast the structure, function and location of various types of plant and animal tissues.
20. Discuss the plant physiological processes of water and nutrient transportation.
21. Describe plant hormones important to growth and other plant processes.
22. Compare and contrast the structure and function of major organ systems in representative organisms.
23. Compare physiological process: digestion, transport of materials, respiration, excretion, and regulation in representative organisms.
24. Discuss the fitness of the earth's environment to the presence of life.
25. Discuss the concept of a food chain and ecological pyramids.
26. Discuss the nitrogen, carbon, and oxygen cycles.
27. Explain the different stages of succession
28. Describe the Competitive Exclusion Principle and how it applies to the creation of ecological niches.
29. Describe the different population growth scenarios and how carrying capacity

- impacts population growth.
30. Discuss the human role in the ecology of earth.

IV. Course Content

The following topics may be included; however, the order of presentation, relative emphasis and the depth of treatment will depend on the preferences on the instructor.

- A. Introduction to Biology
 - 1. Characteristics of Living Things
 - 2. Levels of Organization
 - 3. Science and Scientists
- B. Organic Evolution
 - 1. History of Evolutionary Thought
 - 2. Darwin's Theory of Evolution by Natural Selection
 - 3. Neo-Darwinism (Population Biology)
 - 4. Microevolution: Genetic Variation and Change within Species
 - 5. Macroevolution: Speciation
- C. Taxonomy and Classification
 - 1. Classification Hierarchy
 - 2. Binomial Nomenclature
 - 3. Definition of Species
- D. Diversity of Life
 - 1. Domain Archaea and Bacteria (Characteristics and Classification)
 - 2. Protistan Forms (Characteristics and Classification)
 - 3. Kingdom Fungi (Characteristics and Classification)
 - 4. Kingdom Plantae (Characteristics and Classification)
 - 5. Kingdom Animalia (Characteristics and Classification)
- E. Life Cycles
 - 1. Alternation of Generation Life Cycles
 - 2. Animal Life Cycles
 - 3. Selected Additional Life Cycles
- F. Development in Living Organisms
 - 1. Mechanisms of Development
 - 2. Early Development
 - 3. Differentiation/Specialization
- G. Animal Morphology and Physiology
 - 1. Animal Tissues
 - 2. Basic Organ Systems
 - 3. Higher Animal Physiology
 - a. Digestion
 - b. Circulation
 - c. Immunity
 - d. Respiration
 - e. Excretion
 - f. Control Mechanism
 - 1. Neuronal/Sensory
 - 2. Hormonal
- H. Plant Morphology and Physiology
 - 1. Plant Tissues
 - 2. Basic Plant Structures
 - 3. Vascular Plant Physiology

- a. Root (soil relations, nutrient and water uptake)
 - b. Stem (vascularization and translocation)
 - c. Leaf (photosynthesis, respiration, transpiration, and water balance)
 - d. Defense Mechanisms
 - e. Control Mechanisms
- I. Ecological Adaptations/Ecosystem Dynamics
- 1. Trophic Levels/Energy Flow
 - 2. Plant Populations/Communities
 - a. Succession
 - b. Ecological Niche
 - c. Organismic Interactions
 - d. Cycling of Nutrients

Laboratory Content

Through laboratory and field trips the following content will be covered:

- A. Scientific Inquiry and Experimental Design
- B. Introduction to Laboratory Equipment and Procedures
- C. Plant Anatomy
- D. Plant Physiology
- E. Survey of Prokaryotes
- F. Survey of Protista: Algae
- G. Survey of Protista: Protozoa
- H. Survey of Kingdom Fungi
- I. Survey of Kingdom Plantae: Liverworts, Mosses and Hornworts
- J. Survey of Kingdom Plantae: Seedless Vascular Plants
- K. Survey of Kingdom Plantae: Gymnosperms
- L. Survey of Kingdom Plantae: Angiosperms
- M. Ecology: Diversity and Interaction in Plant Communities
- N. Survey of Kingdom Animalia: Phyla Porifera and Cnidaria
- O. Survey of Kingdom Animalia: Phyla Platyhelminthes and Nematoda
- P. Survey of Kingdom Animalia: Phyla Mollusca and Annelida
- Q. Survey of Kingdom Animalia: Phylum Arthropoda
- R. Survey of Kingdom Animalia: Phyla Echinodermata, Hemichordata, and Chordata
- S. Animal Tissues
- T. Basic Mammalian Anatomy
- U. Embryology

V. Assignments

A. Appropriate Readings

Reading assignments which will be used to enhance the learning process may include, but are not limited to:

- 1. Standard college level lecture and laboratory texts
- 2. Scientific journals such as Scientific American and Science
- 3. Electronic and other archival research on a variety of topics in biology
- 4. Newspaper articles relevant to current topics in biology

B. Writing Assignments

In order to successfully complete the course, students must demonstrate understanding of course content through writing assignment which may include, but are not limited to:

1. Essay answers to questions on mixed format examinations
2. Detailed scientific report on an area of evolutionary or ecological biology.
3. Written analysis of weekly laboratory exercises in biology.

C. Expected Outside Assignments

Examples of outside assignments may include, but are not limited to:

1. Reading and writing assignments as specified in the course syllabus.
2. Library and Learning Center: electronic and other archival research on a variety of topics in the field of biology.
3. Read and summarize newspaper articles relevant to current topics in biology.

D. Specific Assignments that Demonstrate Critical Thinking

This course presents many examples of the utilization of critical thinking by scientists for the advancement of scientific knowledge. Examples of assignments that demonstrate critical thinking may include, but are not limited to:

1. Review of periodicals and newspapers
2. Analysis and synthesis of information presented in the text and during lecture

VI. Methods of Evaluation

The first day of class the instructor will provide each student with a written course syllabus indicating the evaluation procedures to be used. The formulation of a student grade will be based upon:

Traditional Classroom Instruction

1. Performance on mixed-format including essay questions asking students to critically analyze topics discussed in class. Sample essay questions:
 - a. Select two specific plant or animal tissues and explain how their particular structure relates to their function.
 - b. Describe a specific example of reduction division (include stages and significant events) and explain the significant of reduction division to sexually reproducing organisms.
2. Explain how a closed system such as a sealed and balanced aquarium (appropriate numbers of various types of living organisms) might be able to persist for many years.
3. Describe seed germination and the early development of the plant body includes various internal and external factors that affect plant growth in apical meristems and cambial layers.
4. Discuss a particular ecosystem within a terrestrial biome: include energy flow and examples of interactions that occur between living organisms in the natural community.
 - a. Performance on laboratory practical exams
 - b. Performance on laboratory exercises and write-ups of those exercises

Hybrid Delivery

A combination of traditional classroom and online evaluations will be used, such as (1) Traditional Classroom: objective examinations and essay examinations and (2) Online delivery: online quizzes, essay forum postings, chat rooms and email communications.

VII. Methods of Delivery

Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee.

Traditional Classroom Delivery Correspondence Delivery

Hybrid Delivery Online Delivery

Traditional Classroom Instruction

Methods of instruction may include, but are not limited to:

1. Lecture and computer assisted presentations
2. Computer generated tutorials
3. Laboratory
4. Discussion and problem solving performed in and outside class
5. Homework and extended projects
6. Collaborative projects

Hybrid Delivery

Hybrid modality may involve face to face instruction mixed with online instruction. A minimum of 1/3 of instruction including 100 % of labs will be face to face. The remaining hours will be taught online through a technology platform as adopted by the district.

VIII. Representative Texts and Supplies

Required text:

Required text: Reece, Urry, Cain, Wassernam, Minorsky, Jackson Campbell Biology, 12th Edition, 2021, Pearson Education, ISBN-10: 0135188743 or 13:9780135188743

Required text:

In-house, Observations in Organismic Biology Laboratory Manual.

Recommended text:

T. Rust, *A Guide to Biology Lab*, 1983 Southwest Educational

IX. Discipline/s Assignment

Biological Sciences

X. Course Status

Current Status: Active

Original Approval Date: 04/27/2010

Course Originator: Susan G. Mouck

Revised By: Tiffany Baiocchi, Kelly Kissane

Curriculum/Academic Standards Committee Revision Date: 12/06/2022