BIOL A280: EVOLUTIONARY ECOLOGY

Item	Value
Curriculum Committee Approval Date	12/06/2023
Top Code	040100 - Biology, General
Units	4 Total Units
Hours	108 Total Hours (Lecture Hours 54; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

For majors in the biological sciences. Evolutionary and ecological principles and their relevance at several levels of organization. Includes principles governing classification of life, principles of evolution, conditions for life, adaptations to the environment, analysis of ecological niches, population, and community/ecosystem ecology from an evolutionary viewpoint. Field trips are required for this course. PREREQUISITE: BIOL A180. ADVISORY: BIOL A182 or BIOL A182H, and BIOL A183; or BIOL A185. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Identify factors that influence population growth rates, including intraspecific and interspecific interactions.
2. Describe connections between the physical and chemical environmental factors and the organisms in various habitats.
3. Discuss the various methods of evolution that may have occurred in a particular population based on the evidence presented.
4. Design, conduct, analyze, and make conclusion on an experiment based on their observations in the field or in the lab.

Course Objectives

- 1. Identify the major groups of living organisms and be able to use taxonomic keys and/or field guides for identification.
- 2. Describe the process of evolution, speciation, and extinction.
- 3. Demonstrate use of Hardy-Weinberg equations and understanding of population genetics.
- 4. Analyze the importance of abiotic factors and organisms adaptations to them.
- 5. Identify the factors regulating population growth and construct various population life tables.
- 6. Identify properties of intraspecific and interspecific interactions.
- 7. Correlate the environment and the organisms that form communities and ecosystems.
- 8. Set up and conduct lab experiments.
- 9. Set up and conduct field experiments.
- 10. Analyze lab and field data and write conclusions.
- 11. Deduce conclusions using the scientific method.

Lecture Content

COURSE CONTENT AND SCOPE/TOPIC OUTLINE: Taxonomy Taxonomic hierarchy Bionomial nomenclature Three domains of life Features of each major taxonomic group Examples of representative organisms in each major taxa Evolution Variation in populations Population genetics Hardy-Weinberg equation Mutations, Gene Flow, Genetic Drift (bottleneck and founders effect, Sexual Selection, and Natural selection) Patterns of evolution Overview of biological evolution on earth Conditions for Life Abotics, evolution, and distribution Temperature Water Light Soil/substrate Inorganic nutrients/nutrient cycles Gases: dissolvability Current and Wind Habitat Disturbance Climate Population Ecology Density Dispersion/Range Distribution Patterns Age structure Survivorship Population growth Growth potential Population regulation Intraspecific interactions Competition outcomes Community/Ecosystem Ecology Community characteristics Interspecific interactions Community change (succession) Ecosystem ecology Productivity: primary and secondary Trophic structure and Energy flow Food webs Keystone and Dominant Species Nutrient cycles Biome characteristics: climate, flora, and fauna LAB TOPICS Classification of life Survey of biomes Adaptions of organisms for survival in various habitats Population genetics Natural selection Field measurement techniques Analyzing data, contructing tables and graphs, and basing conclusions on results Population modeling Design and implement a semester-long experiment Present findings in a research paper and as a presentation to the class

Lab Content

Classification of life Survey of biomes Adaptions of organisms for survival in various habitats Population genetics Natural selection Field measurement techniques Analyzing data, constructing tables and graphs, and basing conclusions on results Population modeling Design and implement a semester-long experiment Present findings in a research paper and as a presentation to the class

Method(s) of Instruction

- Lecture (02)
- Lab (04)

Instructional Techniques

Lecture illustrated with various media; reading assignment; library research assignments In Lab, students will work in small groups applying lecture topics in multiple lab and field exercises with instructor.

Reading Assignments

Assigned text and journal articles. (2 hours per week)

Writing Assignments

Essay question(s) on each exam and a research paper based on independent experiment. (1.75 hours per week)

Out-of-class Assignments

Various lecture assignments, maintaining a laboratory field journal, and conducting an independent experiment. (3 hours per week)

Demonstration of Critical Thinking

Lecture examinations with written essays. Design and implementation of an independent experiment. Analysis of multiple experiments conducted throughout the semester in lab.

Required Writing, Problem Solving, Skills Demonstration

1. Essay question(s) on each exam2. Lecture Assignments 3. Maintaining a field journal with a narrative at the beginning of each entry and a conclusion of the field/lab experiment.

Eligible Disciplines

Biological sciences: Masters degree in any biological science OR bachelors degree in any biological science AND masters degree in biochemistry, biophysics, or marine science OR the equivalent. Masters degree required. Ecology: Masters degree in ecology or environmental studies OR the equivalent OR see interdisciplinary studies. Masters degree required.

Textbooks Resources

1. Required Sher, A. and Molles, M.C.. Ecology: Concepts and Application, 9th ed. New York: McGraw Hill, 2021 2. Required Smith, T.M. and Smith, R.L.. Elements of Ecology, 9th ed. Pearson, 2014 Rationale: No new edition yet (2023 search)