J. Sargeant Reynolds Community College
Course Content Summary

Course Prefix and Number: **BIO 270** **Credits:** **3**

Course Title: **General Ecology**

Course Description:

Studies interrelationships between organisms and their natural and cultural environments with emphasis on populations, communities, and ecosystems. Prerequisites: Any two of the following prerequisites: BIO 101, BIO 102, BIO 110, BIO 120. Lecture 3 hours. Lab and recitation 3 hours. Total 6 hours per week. 4 credits.

General Course Purpose:

This is a one semester course designed to build upon the student's understanding of the basic principles and concepts of ecology attained in prerequisite courses. It serves as a lab science option. It is intended to prepare students for majors level coursework in ecology and evolution.

Course Prerequisites/Corequisites*:*

Any two of the following prerequisites: BIO 101, BIO 102, BIO 110, BIO 120

Course Objectives:
Upon completing the course, the student will be able to:

Scientific Literacy
- Critically evaluate readings to determine their validity and relevance.

Quantitative reasoning
- Perform accurate calculations, interpret scientific data and graphs, and use results to support conclusions.
- Analyze data collected through experiments in lab. Present and discuss the findings and conclusions derived from data, with chart/spreadsheet and graphs.
- Use mathematical models to simulate ecological interactions and make predictions. Interpret graphs and tables generated by the models.

Critical thinking
- Discriminate among degrees of credibility, accuracy, and reliability of inferences drawn from given data. Determine when conclusions are supported by the information provided.

Introduction to Ecology and Evolution
- Explain science as a way of knowing about the world. Compare and contrast ecology, environmental science, and environmentalism.
- Explain how ecologists using scientific methods to study the world at different levels of interaction.
- Explain the general trends in the physical environment on Earth (e.g., latitude, elevation, seasons, convection currents).
- Compare and contrast the major terrestrial and aquatic biomes found on Earth.
- Explain the concept of a niche.

- Compare and contrast different modes of evolution.
- Explain how mathematical models can be used by ecologists.
- Use the Hardy-Weinberg principle to determine whether a population is evolving

Physiological and Behavioral Ecology
- Explain the difference between conformers and regulators, including advantages/disadvantages of each approach.
- Compare and contrast the ways organisms deal with temperature.
- Compare and contrast the ways organisms deal with water availability.
- Compare and contrast the ways organisms deal with energy availability.
- Compare and contrast the ways organisms deal with nutrient availability.
- Compare and contrast the ways organisms interact socially.

Population Ecology
- Explain how ecologists measure size and density of various populations.
- Use a life table to understand and make predictions about a population.
- Compare and contrast various models of population growth.
- Compare and contrast the three types of survivorship curves.
- Explain density-dependent and density-independent effects.
- Explain how life history theory is applied to population ecology.
- Explain how populations may be better modeled as metapopulations.

Population Interactions
- Describe the difference between fundamental and realized niches.
- Compare and contrast various outcomes of niche overlap.
- Describe the competitive exclusion principle.
- Use competition models to show how the outcome of competition depends on characteristics of the species and the environment.
- Use predator-prey models to make
- Compare and contrast functional responses.
- Describe strategies employed by species (predators/prey, herbivores/plants, and parasites/hosts) in consumptive relationships.
- Explain mutualism, including when such a relationship would be likely to be an evolutionary stable strategy.

Community Ecology
- Explain how ecologists measure diversity within a community.
- Interpret a rank abundance curve.
- Calculate species diversity.
- Explain the concept of species succession and relate it to the biomes discussed in Unit 1.
- Explain the role of disturbance, stability, and resilience in ecological succession.
- Explain how the theory of island biogeography applies to community ecology.

Ecosystem Ecology
- Explain the various roles in a food web.
- Compare and contrast the movement of energy and nutrients through a food web.
- Compare and contrast primary and secondary productivity.
- Compare and contrast competition and apparent competition.
- Explain how indirect relationships affect species within a community.
- Explain the concept of keystone species.
- Compare and contrast bottom-up and top-down control in a community.

- Explain the concept of a trophic cascade.

Conservation Ecology

- Explain the reason that ecologists may be concerned with anthropogenic changes.
- Explain how overharvesting can lead to species extinction.
- Explain the role of habitat loss on ecological communities.
- Explain the role of pollution on species extinction.
- Explain how anthropogenic climate change affects ecosystems.
- Explain how invasive species disrupt communities.
- Explain how the theory of island biogeography can be applied to terrestrial landscapes.
- Apply ecological principles to human populations.

Major Topics to be Included:

- Introduction to Ecology and Evolution
- Physiological and Behavioral Ecology
- Population Ecology
- Population Interactions
- Community Ecology
- Ecosystem Ecology
- Conservation Ecology

Effective Date/Updated: August 1, 2022