



Course Description

PCB3043 | Fundamentals of Ecology | 3.00 credits

This is a foundations course in ecology. In this course, students will learn the basic principles of ecology at organismal, population, community, and ecosystem levels, including consideration of Florida's ecosystems and human impact on those systems. Prerequisites: BSC2011, 2011L

Course Competencies:

Competency 1: The student will demonstrate knowledge of the scientific process and the study of natural Phenomena by:

1. Describing the history of ecology and explaining its relationship to other natural sciences
2. Determining the relevance of ecology to human affairs
3. Describing how the scientific method is applied to ecological problem solving
4. Designing and completing an ecological investigation that includes quantitative and qualitative data
5. Explaining the importance of modeling in ecology

Competency 2: The student will demonstrate knowledge of the fate of energy in the ecosystem and the basic structure and function of an ecosystem by:

1. Identifying the source and fate of the energy that drives ecosystems
2. Discussing how differences in solar radiation striking the Earth and Earth's rotation and revolution affect seasonal temperature changes, global patterns of atmospheric heating and cooling, ocean currents, and air circulation
3. Defining ecosystem and identifying an ecosystem's basic structural components
4. Defining primary production and identifying the factors that contribute to variation in productivity among ecosystems
5. Explaining how abiotic and biotic factors contribute to the development of the various types of soils
6. Comparing various explanations for worldwide trends in biodiversity
7. Explaining the role of fire in maintaining the health of some ecosystems

Competency 3: The student will demonstrate knowledge of factors contributing to changes in population growth and Distribution by:

1. Defining population and discussing its relevance in the hierarchy of biological organization
2. Identifying and describing the factors contributing to changes in populations over time: birth rate, death rate, immigration, emigration, and dispersal
3. Identifying the different types of population distributions and the factors contributing to such patterns
4. Describing how life tables are used to track population growth
5. Distinguishing exponential and logistic population growth by comparing their growth curves and discussing the factors that control growth
6. Defining carrying capacity and explaining its relationship to the logistic growth curve
7. Identifying and evaluating the factors that contribute to species extinction
8. Explaining the factors limiting population growth, including density dependence, density independence, predator-prey and competitor relationships, and social dominance
9. Comparing the characteristics of r-selected and k-selected reproductive strategies

Competency 4: The student will demonstrate knowledge of ecology by:

1. Describing basic structure and function of a community and the energy flow through it
2. Describing how the First and Second Laws of Thermodynamics govern energy flow in an ecosystem and help determine the efficiency of energy transfer
3. Comparing biomass and energy pyramids

4. Describing the energy flow through trophic levels
5. Illustrating a food web comprising local flora and fauna examples
6. Explaining how keystone species and ecological dominants influence community structure
7. Discussing the factors that contribute to species biodiversity in terrestrial and aquatic ecosystems
8. Describing various types of community architectural elements in terrestrial and aquatic communities with particular emphasis on South Florida
9. Distinguishing between an edge, a gap, and an ecotone and explaining why edges are species rich
10. Describing the stages of ecological succession in a local ecosystem and the resulting changes in species diversity
11. Identifying the abiotic and biotic factors that result in community changes over time
12. Discussing the significance of the Lotka-Volterra model and identifying the four potential outcomes of interspecific competition according to this model
13. Defining niche as an n-dimensional hypervolume
14. Discussing the need and benefits of ecological community restoration programs, particularly in South Florida

Competency 5: The student will demonstrate knowledge of the relationship(s) between humans and nature and of the importance of environmental sustainability by:

1. Explaining why a new paradigm for the relationship between humans and nature is necessary for long-term ecosystem stability
2. Identifying the roots of human attitudes towards nature and the resulting environmental consequences
3. Describing several alternatives to non-Western views of nature
4. Listing the components of a new “environmental ethic” rooted in an eccentric cosmology
5. Explaining why environmental sustainability is an essential concern to the study of ecology and environmental science

Competency 6: The student will explain how organisms interact with one another and the physical setting by:

1. Defining and differentiating weather, climate, and microclimate using local examples
2. Discussing how daily and seasonal variations in light levels affect the rhythms of life
3. Identifying and categorizing common ecological limiting factors and describing how nutrients, acidity, salinity, moisture, and temperature affect organisms
4. Listing, describing, and giving examples of community interactions between two species: predation, parasitism, parasitoidism, amensalism, commensalism, mutualism, and competition
5. Identifying the strategies that predators use to capture prey
6. Identifying plant and animal defensive strategies against predation
7. Identifying the factors that affect the success of introduced species

Competency 7: The student will relate concepts in environmental biology to contemporary, historical, technological, and societal issues by:

1. Defining and differentiating weather, climate, and microclimate using local examples
2. Discussing how daily and seasonal variations in light levels affect the rhythms of life
3. Identifying and categorize common ecological limiting factors and describe how nutrients, acidity, salinity, moisture, and temperature affect organisms
4. Listing, describing, and giving examples of community interactions between two species: predation, parasitism, parasitoidism, amensalism, commensalism, mutualism, and competition
5. Identifying the strategies that predators use to capture prey
6. Identifying plant and animal defensive strategies against predation
7. Identifying the factors that affect the success of introduced species

Competency 8: The student will relate concepts in environmental biology to contemporary, historical, technological, and societal issues by:

1. Summarizing the impacts of a growing human population and hyper-consumption on the planet and on South Florida, including impacts on living space, agriculture, water and soils, animal and plant populations, the atmosphere, the oceans, and ecosystems

2. Predicting the long-term implications should human activities continue at the present level
3. Describing the impact of nonrenewable energy resources (extraction, transport, processing, consumption, and waste products) on ecosystems
4. Discussing the impact of human activities on each biogeochemical cycle
5. Identifying the most critical consequence of the $I = P \times A \times T$ equation
6. Identifying worldwide human population growth and worldwide resource consumption patterns
7. Identifying regions of greatest population growth and greatest resource consumption

Competency 9: The student will relate behavior to internal or external environmental stimulus, identifying what it means for an organism to be adapted to its environment by:

1. Describing how ecosystems are classified
2. Describing how ecosystem distribution is affected by latitude and altitude
3. Identifying the abiotic factors that influence the distribution of terrestrial and aquatic ecosystems, such as temperature, moisture, light, salinity, nutrients, and topography

Competency 10: The student will demonstrate knowledge of biomes and major ecosystems by:

1. Describing several local ecosystems, including major geographical reference points and the abiotic and biotic factors that create and maintain them
2. Identifying the biotic and abiotic characteristics, characteristic flora and fauna, and geographical locations of the tundra, taiga, deciduous forests, grasslands, savannahs, chaparral, tropical rainforests and deserts

Competency 11: The student will identify major biogeochemical cycles and processes by:

1. Illustrating the biogeochemical cycles of oxygen, carbon, nitrogen, phosphorus, and water, using local examples and identifying biotic and abiotic factors influencing nutrient cycling
2. Describing the role of decomposition in the environment
3. Distinguishing among types of decomposers based on function and size in terrestrial and aquatic environments

Competency 12: The student will conduct and complete the process of scientific inquiry by:

1. Designing an ecological investigation that quantitatively measures hypothesized patterns of species-abundance and distribution of a natural area and measures potential abiotic and biotic factors affecting species-abundance and distribution
2. Examining and graphing measured patterns of species abundance and distribution
3. Relating measured patterns of species-abundance and distribution to measured abiotic and biotic factors
4. Documenting the determined patterns of species abundance and distribution relative to measured abiotic and biotic factors

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Demonstrate knowledge of diverse cultures including global and historical perspectives
- Describe how natural systems function and recognize the impact of humans on the environment