Miami Dade College

Course Description

PCB2033 | Introduction to Ecology | 3.00 credits

This course will provide students with an understanding of an appreciation for how organisms relate to one another and their environment at the levels of biological organization from the individual to the biosphere. Prerequisites: PSC1515 or BSC2011.

Course Competencies:

Competency 1: The student will understand the principles of ecological relationships between organisms at different levels of biological organization, from individual to biosphere by:

1. Describing the concept of ecological organization and the levels of biological organization from individuals to ecosystems.
2. Identifying and explaining the interactions between organisms within a community, including competition, predation, mutualism, and commensalism.
3. Analyzing how abiotic factors such as climate, topography, and soil composition influence ecological relationships.
4. Evaluating the role of biotic and abiotic factors in shaping the distribution and abundance of species within ecosystems.
5. Discussing the concept of ecological succession and its role in community dynamics over time.
6. Examining the impacts of human activities on ecological relationships and ecosystem stability.
7. Applying ecological principles to real-world scenarios and case studies to propose solutions for environmental challenges.
8. Synthesizing information from scientific literature and primary sources to support arguments related to ecological relationships.
9. Demonstrating proficiency in ecological research methods, including field observations, data analysis, and experimental design.
10. Communicating effectively about ecological concepts and principles through written reports, oral presentations, and multimedia formats

Competency 2: The student will analyze the impact of organisms on their environment and the biosphere, considering both biotic and abiotic factors by:

1. Evaluating organisms' ecological roles within ecosystems, including their contributions to nutrient cycling, energy flow, and ecosystem stability.
2. Analyzing the mechanisms by which organisms modify their physical and chemical environments, including processes such as soil formation, sedimentation, and atmospheric composition.
3. Examining the influence of biotic factors such as population size, species diversity, and trophic interactions on ecosystem structure and function.
4. Investigating the impacts of abiotic factors such as climate change, pollution, and habitat destruction on organism-environment interactions and ecosystem health.
5. Assessing the resilience of ecosystems to natural disturbances, such as wildfires, hurricanes, disease outbreaks, and human-induced stressors.
6. Exploring the concept of ecological footprint and its implications for resource consumption, biodiversity loss, and global environmental sustainability.
7. Criticizing analysis of case studies and empirical research on the ecological impacts of invasive species, habitat fragmentation, and overexploitation of natural resources.
8. Applying systems thinking approaches to understand the interconnectedness of ecological processes and human activities at local, regional, and global scales.
9. Developing strategies for mitigating and adapting to environmental change, including ecosystem restoration, conservation planning, and sustainable resource management.
10. Communicating findings and recommendations related to organism-environment interactions effectively through written reports, presentations, and multimedia formats, addressing diverse stakeholders and audiences.

Competency 3: The student will evaluate the interconnectedness of biological systems and their relevance to organism-environment interactions by:

1. Analyzing the interdependence between biological systems and their surrounding environments, considering factors such as nutrient cycling, energy flow, and habitat suitability.
2. Evaluating the reciprocal relationships between organisms and their environments, assessing how organismal behaviors, adaptations, and physiological processes shape ecosystem dynamics.
3. Examining the role of feedback mechanisms and regulatory processes in maintaining homeostasis within biological systems in response to environmental changes.
4. Investigating the influence of biotic and abiotic factors on organism-environment interactions, including species interactions, population dynamics, and community structure.
5. Exploring the implications of organism-environment interactions for ecosystem services, biodiversity conservation, and ecosystem resilience.
6. Critiquing assesses empirical research and theoretical frameworks concerning organism-environment interactions, integrating multiple perspectives from ecology, evolutionary biology, and environmental science.
7. Applying systems thinking approaches to understand the complex webs of interactions within and between biological systems and their environments.
8. Developing interdisciplinary perspectives on the relevance of organism-environment interactions for addressing global environmental challenges, such as climate change, habitat degradation, and biodiversity loss.
9. Synthesizing information from diverse sources, including scientific literature, field observations, and experimental data, to formulate evidence-based conclusions about the interconnectedness of biological systems.
10. Communicating effectively about the interconnectedness of biological systems and their relevance to organism-environment interactions through written reports, oral presentations, and multimedia formats, adapting the message to different audiences and stakeholders.

Competency 4: The student will be able to understand how organisms are adapted to survive, grow and reproduce by:

1. Identifying and describing the diverse adaptations organisms possess to survive in their respective environments, considering climate, habitat, and resource availability.
2. Explaining the physiological, morphological, and behavioral adaptations that allow organisms to grow and develop within their ecological niches.
3. Analyzing the evolutionary mechanisms that drive the development and maintenance of adaptations in populations, including natural selection, genetic drift, and gene flow.
4. Evaluating the trade-offs associated with different adaptive traits and behaviors, considering their costs and benefits in terms of survival and reproductive success.
5. Investigating how environmental pressures, including biotic and abiotic factors, shape organisms' adaptive strategies over time.
6. Examining examples of coevolution and symbiotic relationships between organisms, highlighting the reciprocal adaptations between interacting species.
7. Exploring the concept of reproductive fitness and its role in shaping the evolution of reproductive strategies and behaviors in organisms.
8. Critiquing assesses empirical studies and theoretical frameworks in evolutionary biology to understand the principles underlying organismal adaptations.
9. Applying knowledge of organismal adaptations to predict how species may respond to environmental changes, such as climate change or habitat loss.
10. Communicating effectively about organismal adaptations through written reports, oral presentations, and multimedia formats, conveying complex concepts to diverse audiences in an accessible manner.

Competency 5: The student will understand the tremendous diversity of how organisms interact with one another by:

1. Identifying and classifying various types of organismal interactions, including but not limited to competition, predation, parasitism, mutualism, and commensalism.
2. Analyzing the ecological consequences of different organismal interactions on population dynamics, community structure, and ecosystem functioning.
3. Exploring the evolutionary mechanisms underlying the development and maintenance of diverse interaction strategies among organisms, considering coevolution, reproductive isolation, and ecological specialization.
4. Investigating how environmental factors, including abiotic conditions and resource availability, influence the prevalence and outcomes of organismal interactions across different ecosystems and geographic regions.
5. Synthesizing information from empirical studies, theoretical models, and observational data to comprehensively understand the complexity and variability of organismal interactions within and between ecological communities.

Competency 6: The student will understand how the forces of natural selection and ecological succession shape populations and communities by:

1. Evaluating the mechanisms of natural selection, including variation, heritability, and differential reproductive success, in shaping the genetic composition of populations over time.
2. Analyze the impact of selective pressures, such as predation, competition, and environmental changes, on the adaptation and evolution of organisms within populations.
3. Investigating the process of ecological succession, including primary and secondary succession, and its role in shaping community structure and diversity over time.
4. Examining the interactions between species during ecological succession, including facilitation, inhibition, and tolerance, and their influence on community dynamics.
5. Synthesizing empirical evidence and theoretical models to understand how the forces of natural selection and ecological succession interact to shape the structure, function, and resilience of populations and communities in different ecosystems

Competency 7: The student will understand the uniqueness of our South Florida ecosystem by:

1. Describing the hierarchical organization of biological systems, including populations, communities, and ecosystems, and the interrelationships between these levels.
2. Analyzing the factors influencing population dynamics, including birth rates, death rates, immigration, and emigration, and their effects on population size and structure.
3. Evaluating the biotic and abiotic factors shaping community structure and composition, including species interactions, resource availability, and disturbance regimes.
4. Investigating the flow of energy and nutrients through ecosystems, including primary production, trophic interactions, and biogeochemical cycles.
5. Synthesizing information from empirical studies and theoretical frameworks to understand the functioning and resilience of populations, communities, and ecosystems in response to environmental changes and disturbances.

Competency 8: The student will have a greater appreciation of the beauty and fantastic complexity of the natural world by:

1. Developing observational skills to recognize and appreciate the natural world's aesthetic qualities and intricate details, including landscapes, ecosystems, and biodiversity.
2. Exploring the diverse forms of life found in different habitats and ecosystems, appreciating the beauty and complexity of organisms and their interactions.
3. Investigating the underlying ecological processes and evolutionary adaptations that contribute to natural systems' remarkable diversity and functionality.
4. Engaging with artistic and creative expressions inspired by the natural world, such as nature photography,

painting, poetry, or music, to deepen appreciation and understanding.

5. Reflecting on personal experiences and connections with nature to cultivate a sense of wonder, awe, and stewardship toward the Earth's ecosystems and biodiversity.

Learning outcomes:

- Describe how natural systems function and recognize the impact of humans on the environment
- Solve problems using critical and creative thinking and scientific reasoning