Fall 2016

BIO 270
General Ecology

Faculty Name: Enter Faculty Name Here

Program Head: Enter Program Head Here

Dean's Review:

Dean's Signature: _____Date Reviewed: ___/___/_____

Revised: Fall 2016

VIRGINIA WESTERN COMMUNITY COLLEGE
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BIO 270
General Ecology

COURSE OUTLINE

Prerequisites:

BIO 101 and BIO 102, or Division approval

Course Description:

Studies interrelationships between organisms and their natural and cultural environments with emphasis on populations, communities, and ecosystems.

Semester Credits: 4 **Lecture Hours: 3** **Lab/Recitation Hours: 3**

Course Outcomes:

At the completion of this course, the student should be able to:

- Explain what ecology is.
- Relate how the physical environment, particularly climate, affects which biomes occur where in the biosphere.
- Describe the water cycle and explain how the unique properties of water affect life on Earth.
- Explain how properties of light and soil affect terrestrial biodiversity.
- Describe how adaptations provide evidence for the concept of natural selection in populations.
- Relate plant and animal adaptations to their environment.
- Explain the nature of various species interactions including interspecific competition, predation, parasitism, mutualism and commensalism.
- Describe factors that influence the structure of communities, including food webs and plant succession.
- Relate decomposition and nutrient cycling, particularly carbon, nitrogen and phosphorus.
- Explain the key characteristics of aquatic ecosystems.
- Describe how hydrology structures wetland ecosystems.

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Textbook:

Elements of Ecology by Thomas M. Smith and Robert Leo Smith, 9th edition. ISBN: 9780321934185. Benjamin Cummings.

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Chapter 1
- What is ecology?
- Organisms interact with the environment in the context of an the ecosystem
- Ecological systems form an hierarchy
- Ecologists study pattern and process at many levels

Chapter 2
- Solar radiation – patterns and effects on climate
- Global patterns of air circulation, temperature and precipitation
- Effects of topography on climate
- Concept of microclimates

Chapter 3
- Physical properties of water
- How light and temperature vary with water depth
- Oxygen as a limiting factor in aquatic environments

Chapter 4
- Soil formation – 5 inter-related factors
- Distinguishing physical characteristics of soil, soil horizons
- Cation exchange capacity, base saturation and soil fertility

Chapter 5
- Darwin's definition of natural selection
- Genetic variation in populations
- Adaptations as products of natural selection

Chapter 6
- Review of C3 photosynthesis
- C4 and CAM photosynthesis – adaptations for improved water use
- Adaptations of plants to different light environments
- Plant adaptations to nutrient availability
- Plant adaptations to wetland environments

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Chapter 7

- Consequences of body size in animals
- Different strategies for acquisition of energy and nutrients
- Digestive tracts of ruminants, non-ruminant herbivores and carnivores
- Strategies for temperature regulation in animals and tradeoffs of endothermy and ectothermy
- Heterothermy – the best of both worlds?
- Torpor and hibernation to meet high energy costs of staying warm

Chapter 12

- How species interactions are classified
- Species interactions as drivers of natural selection
- The influence of species interactions on niches and adaptive radiation

Chapter 13

- What is interspecific competition?
- Experimental evidence for the competitive exclusion principle
- Non-resource factors as drivers of Interspecific competition
- Competition along environmental gradients
- Resource partitioning
- What is a niche? The concepts of fundamental vs. realized niche

Chapter 14

- Forms of predation
- Optimal foraging theory
- Co-evolution of predator and prey
- Predator defenses
- Herbivory as a form of predation
- Herbivore defenses
- Vegetation-herbivore-carnivore systems of Interspecific competition

Chapter 15

- Characteristics of parasites
- Parasite-host relationships, direct and indirect transmission, intermediate hosts (vectors)
- Host responses to parasitic infections
- What is mutualism? Obligate vs. facultative mutualism
- Importance of mutualism in nutrient uptake in plants, pollination and seed dispersal
- What is commensalism?

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Chapter 16 & 17

- Species diversity in communities
- Dominants and keystone species
- Food webs
- Physical structure and zonation in communities

Chapter 18

- Succession as a natural process in communities
- Primary vs. secondary succession
- Autogenic and allogenic factors driving succession

Chapter 21

- The importance of nutrient cycling
- Decomposition processes and the factors influencing decomposition
- Nutrient mineralization and soil organic matter
- Important processes in the rhizosphere
- Factors affecting rates of nutrient cycling
- Nutrient cycling in stream ecosystems

Chapter 22

- What are biogeochemical cycles? What natural and anthropogenic factors affect these?
- The carbon cycle
- The nitrogen cycle
- The phosphorus cycle

Chapter 23

- Environmental factors driving ecosystem distribution
- Characteristics of plant community and soils, rates of productivity and decomposition, representative animals for each of the following biomes:
    - Tropical forests
    - Tropical savannas
    - Temperate grasslands
    - Deserts
    - Chaparral
    - Temperate forests
    - Boreal forests
    - Tundra – arctic and alpine

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Chapter 24

- Lakes – seasonal stratification and zonation of life
- Rivers – adaptations of organisms to different flowing water habitats
- River continuum concept as energy and nutrients move downstream
- Importance of estuaries

Chapter 25

- Importance of salt marshes
- Importance of mangrove forests
- What are freshwater wetlands and what are their key functions
- Hydrology determines wetland plant communities – examples in Virginia

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Suggested Timeline and Sequence

Week #1	**Chapter 1 -** The Nature of Ecology **Chapter 2 -** Climate
Week #2	**Chapter 3 -** The Aquatic Environment
Week #3	**Chapter 4 -** The Terrestrial Environment
Week #4	**Chapter 5 -** Ecological Genetics **Chapter 6 -** Plant Adaptations to the Environment
Week #5	**Chapter 6 -** Plant Adaptations to the Environment **Chapter 7 -** Animal Adaptations to the Environment
Week #6	**Chapter 7 -** Animal Adaptations to the Environment
Week #7	**Chapter 12 -** Species Interactions **Chapter 13** - Interspecific Competition
Week #8	**Chapter 14 -** Predation **Chapter 15 -** Parasitism & Mutualism

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Week #10	**Chapter 15 -** Parasitism & Mutualism
Week #11	**Chapter 16 & 17 -** Community Structure **Chapter 18 -** Community Dynamics
Week #12	**Chapter 18 -** Community Dynamics **Chapter 21 -** Decomposition & Nutrient Cycling
Week #12	**Chapter 21 -** Decomposition & Nutrient Cycling
Week #13	**Chapter 22 -** Biogeochemical Cycles
Week #14	**Chapter 23** - Terrestrial Ecosystems **Chapter 24 -** Aquatic Ecosystems
Week #15	**Chapter 25 -** Coastal & Wetland Ecosystems
Exam Week	**Final Exam - Cumulative** (with new material from Chapters 23-25)

Laboratory projects will include investigations of stream food webs (Chapters 16 &17) and forest communities of the southern Appalachians (Chapter 18).

Notes to Instructors

1. Departmental policy dictates that instructors do not allow students to keep tests.

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