COURSE TITLE & NUMBER: Ecology and Field Biology: BIOL 2201
CREDITS: 4 (3 Lec / 1 Lab)
PREREQUISITES: BIOL 1520, CHEM 1610, or instructor’s consent

CATALOG DESCRIPTION:
Ecology and Field Biology emphasizes a functional approach to ecosystems and explores population dynamics and interactions between and among populations. Community structure and function compare terrestrial and freshwater ecosystems. Field techniques are applied to these concepts of ecology.

OUTLINE OF MAJOR CONTENT AREAS:
1. History and scope of ecology
   A. Diversity of study
   B. Development of the field
   C. Experimental approach
   D. Models and predictions
2. The organism and its environment
   A. Adaptation: natural selection and speciation
   B. Climatic effects
      1. Winter ecology
      2. Microclimates
   C. Response to moisture
   D. Temperature
      1. Distribution
      2. Metabolic response
   E. Light and biological cycles
   F. Nutrients, plants, and consumers
   G. The living soil
      1. Soil profiles
      2. Classification and mapping
3. Whole ecosystem dynamics
   A. Components of ecosystems
   B. Essential processes
   C. Energetics
      1. Primary production
      2. Secondary production
      3. Food chains
   D. Biogeochemical cycles
      1. Nitrogen, phosphorus, sulphur, oxygen, carbon
      2. Interference from pollution
4. Comparison of ecosystems
   A. Grasslands and shrublands
   B. Coniferous forests
   C. Temperate deciduous forests
D. Freshwater systems
   1. Lakes
   2. Streams
   3. Wetlands

5. Population ecology
   A. Defining characteristics of populations
      1. Density
      2. Age structure and sex ratio
      3. Mortality and natality
   B. Growth and regulation
      1. Density-dependent regulation
      2. Density-independent influences
      3. Oscillations and cycles
   C. Intraspecific competition
   D. Life history patterns
      1. r- and K- selection
      2. Mating systems and sexual selection
      3. Reproductive effort
      4. Habitat selection
   E. Interspecific competition
      1. Resource partitioning
      2. Concept of niche
      3. Competition theory
      4. Case studies
   F. Predator-prey systems
      1. Strategies and response
      2. Lotka-Volterra model and oscillations

6. Specific interactions within systems
   A. Plant-herbivore systems
      1. Plant defenses
      2. Response of herbivores
   B. Herbivore-carnivore systems
      1. Prey defenses
      2. Cannibalism
      3. Predator-prey cycles
   C. Symbiotic relationships and evolutionary responses
      1. Parasitism
      2. Mutualism
         a. Co-evolution
         b. Plant-animal case studies

7. The community
   A. Community structure
      1. Biogeography
      2. Population interactions
      3. Community patterns
   B. Disturbances
      1. Fire ecology
2. Floods vs. drought  
3. Mining and timber harvesting  
4. Plant and animal response  
5. Community stability  

C. Succession  
1. Theories and models  
2. The climax  
3. Long term effects  
4. Paleocology  

8. Field and laboratory work  
A. The scientific approach to field studies  
B. Methods of sampling plant and animal populations  
C. Environmental measurements and statistical methods  
D. Measuring productivity and community structure  
E. Ecology field projects and presentations  

**COURSE GOALS/OBJECTIVES/OUTCOMES:**  
1. Students will test hypotheses experimentally and compare results to existing ecological models.  
2. Students will outline the interactions of abiotic and biotic factors and their influences on adaptation.  
3. Students will compare and contrast features of the major terrestrial and aquatic biomes.  
4. Students will discuss population changes in terms of survivorship, reproduction, density-dependent and density-independent growth, competition, symbiosis, and predator-prey interactions.  
5. Students will design and conduct a field experiment and give a presentation to explain results.  
6. Students will summarize the effects of abiotic resource distribution on organisms, including soils, seasonality and climate, common pollutants, and fire.  
7. Students will describe evolutionary strategies, such as co-evolution, and their effects on species interactions and succession.  
8. Students will discuss the role of anthropogenic factors on populations, such as mining and timber harvesting.  

**MNTC GOALS AND COMPETENCIES MET:**  
Natural Sciences  
People and the Environment  

**HCC COMPETENCIES MET:**  
Working Productively and Cooperatively  
Communicating Clearly and Effectively  
Thinking Creatively and Critically  
Practicing Cultural, Economic, and Environmental Sustainability
STUDENT CONTRIBUTIONS:
Students are expected to attend all lecture and laboratory sessions, participate in and contribute to class discussions, complete all assignments on time and request assistance when needed. Attendance is critical for the successful completion of this course.

STUDENT ASSESSMENT SHALL TAKE PLACE USING INSTRUMENTS SELECTED/DEVELOPED BY THE COURSE INSTRUCTOR.

ADDITIONAL INFORMATION:
Field trips are required and involve moderate physical exertion. Transportation to field trip sites is provided by the college.

Clothing appropriate to the field situation should be worn.

Curriculum Approval Date: February 5, 2018
AASC APPROVAL DATE: February 21, 2018
REVIEW DATE: February 2023