Master Course Syllabus

BIOLOGY 2406
Environmental Biology

CIP # 03.0102.5101
CIP Area: Life Sciences

September, 2003

Prepared by:

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BIOLOGY 2406 – Environmental Biology
A Core Curriculum Course

Purpose Statement
The purpose of Environmental Biology is to enable the student to understand basic ecological concepts and apply that understanding to analysis of current societal issues affecting the environment. Specifically, Biology 2406 is an introductory ecology/environmental science course designed to provide students with a foundation for more advanced ecology or environmental science courses.

Course Description
An introductory survey of basic ecological principles including physical and biotic interrelationships within aquatic and terrestrial communities, natural ecosystems, and contemporary environmental issues affecting ecosystems. Field studies are an integral part of the laboratory. **Prerequisite:** BIOL 1406, BIOL 1407, BIOL 1411 or BIOL 1413. Three class hours and three laboratory hours per week. Credit: Four semester hours.

Course Objectives and Student Learning Outcomes

Lecture Objectives: Attain a working knowledge of the following areas:

1. History of ecology as a science.
2. Human impact on the environment, restoration ecology.
3. Abiotic factors affecting the environment.
4. Plant and animal adaptations to their environment.
5. Ecosystem productivity.
6. Population ecology, structure and dynamics.
7. Community structure.
8. Population genetics
9. Interspecific competition, resource partitioning, and niche.
10. Predator/Prey relationships, Coevolution.
11. Biogeography, biodiversity and community succession.
12. Current issues affecting the natural environment.

Laboratory Objectives: Attain a working knowledge of the following areas:

1. Biometrics.
2. Analysis of habitat and microhabitat.
3. Niche, including but not limited to, breadth and overlap.
4. Competition and dispersion, both plant and animal.
5. Population dynamics.
6. Methods of population estimation and statistical analysis of collected data.
7. Aquatic and terrestrial population sampling methods.
8. Stream ecology and water quality assessment.
9. Contemporary environmental issues.

Expanded Course Description

A. Major areas which will be covered in lecture are:

1. Introduction- The History of Ecology as a Science
2. The Physical Environment-Abiotic Factors
3. The Organism and It's Environment
4. Nutrient Cycling and Biogeochemical Cycles
5. Population Ecology
6. Community Structure
7. Population Genetics
8. Interspecific Competition
9. Predation
10. Biogeography, Biodiversity and Community Succession

Major areas which will be covered in laboratory are:

1. Biometrics
2. Habitat Analysis
3. Dispersion and Competition
4. Population Age Structure and Survivorship
5. Population Estimation
6. Vegetation Sampling
7. Stream Ecology, Aquatic Sampling, and Water Quality Analysis
8. Examination of Contemporary Environmental Issues

Course Requirements

Upon completion of the course, the student will have an understanding of at least 60% of the combined lecture and laboratory components of the course. This includes at least 3 major lecture exams and a comprehensive final examination. The student will demonstrate an understanding of the laboratory activities through analysis of data sets collected. A laboratory examination will be designed to address both knowledge and skills.

Grading System

The following areas will be clearly outlined by the instructor in the Course Information Sheet given to the students:

1. Major Exams: At least three major exams covering the lecture material, evenly distributed throughout the semester. Information from laboratory activities may be included on major exams
2. Laboratory Exam: A laboratory practical given during the last lab period covering theory and practical application of material covered in laboratory activities
3. Formal Laboratory Report: Each student will be required to complete a formal laboratory report using data collected during the course of the semester. This report will incorporate analyses of data sets gathered, along with tables, figures, and supporting literature. Complete guidelines will be provided by the instructor.

4. Laboratory exercises and handouts: Given at the discretion of the instructor.
5. Minor Exams/Quizzes/ Homework: Given at the discretion of the instructor.
6. Additional Reports or Projects: Given at the discretion of the instructor.
7. Final Exam: Comprehensive exam covering the entire course.

Outcomes Inventory

Biology 2406 will be evaluated through the following methods:

1. A Pre-test and Post-test instrument to determine the extent of student improvement during the semester.
2. Each Intellectual Competency listed above will be evaluated to measure its attainment. Acceptable evaluation tools for each Intellectual Competency include one or more of the following:
   a) To measure **reading:**
      1. Exam or quiz over assigned textbook readings AND
      2. Lab assignment, exam or quiz over lab book reading OR
      3. Written assignment requiring use of journal articles.
   b) To measure **writing:**
      1. Written assignment AND
      2. Essay question on exam.
   c) To measure **listening:**
      1. Exam or quiz over lecture material OR
      2. Quiz over video viewed.
   d) To measure **critical thinking:**
      1. Lab assignment, exam or quiz involving problem solving.
   e) To measure **computer literacy:**
      1. Computer based assignment.

Calendar

The instructor will ensure that the course content is covered in a manner that fulfills the course objects. The instructor will also provide Course Information Sheets to the student and the administration. Important details including tentative examination dates and due dates for assignments will be provided.

Week	**Lecture Topic**
1.	Introduction to the study of ecology as a science
2.	Abiotic factors-heat, light, chemical elements, nutrients, weather and climate, altitude and latitude, abiotic limits
3.	Plant and animal adaptations to the environment, parasitism and mutualism, decomposers and decomposition
4.	Ecosystem productivity, photosynthesis, nutrient cycling, biogeochemical cycles- Carbon, Nitrogen, Phosphorus, Sulfur, Oxygen, and Water, human impact.
5.	Population ecology-human and faunal/floral: dispersion, density, diversity, mortality, reproductive strategies, population growth and regulation

6. Factors affecting community structure, food webs, ecological pyramids, and human influences upon them.
7. Population Genetics, Hardy-Weinberg model, variation, natural selection, and speciation
8. Interspecific Competition, Lotka-Volterra equation, coexistence, resource partitioning, and niche
9. Predator/prey relationships, responses to predation, coevolution
10. Biogeography, biodiversity, community succession, human disturbance, and restoration ecology

Week	**Laboratory Topic**
1.	Biometrics-measures of central tendency and variation, student's t-test, Chi-square, simple linear regression, correlation
2.	Analysis of habitat, microhabitats, niche breadth and overlap
3.	Competition and dispersion-Poisson distribution, Holgate's point to plant distance and Nearest-neighbor distance, interspecific and intraspecific competition
4.	Population Dynamics-life tables and survivorship, models of population growth and competition simulation models
5.	Population estimation-vertebrate sampling: rodent mark-recapture, catch per unit effort, species density, diversity and similarity indices
6.	Vegetation sampling
7.	Stream ecology, aquatic sampling, water quality assessment
8.	Contemporary environmental issues and relevance

Materials
Required Materials

Textbook: *Elements of Ecology*, 5th edition, Smith and Smith: 2003. Benjamin Cummings, San Francisco.

Laboratory Materials: *Field Laboratory Exercises in Environmental Science:* 10th edition, Enger and Smith: 2000. McGraw-Hill Higher Education.

Recommended Materials
Interactive Biology Multimedia Courseware. 200. Cyber Ed Inc, Paradise, CA