Lecture Contact Hours: 48-54; Homework Hours: 96-108; Total Student Learning Hours: 144-162

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

BIOLOGY 112 – CONTEMPORARY ISSUES IN ENVIRONMENTAL RESOURCES

3 hours lecture, 3 units

Catalog Description
Through the scientific study of basic concepts in ecology, students apply their knowledge and scientific reasoning to the study of contemporary problems dealing with renewable and nonrenewable resources. Environmental resource problems involving air, water, energy, human population growth, and plant and animal diversity are examined in context of their scientific, political, economic and social implications. Alternatives for resolving existing problems and preventing future ones will be explored.

Prerequisite
None

Course Content
1) Introduction
    a. Classification of natural resources
    b. Sustainability
    c. Environmental history
    d. Introduction to the scientific method and its applications in ecology and environmental science
    e. Risk analysis
2) Basic Principles of Ecology
    a. What is ecology? What is environmental science?
    b. Ecological levels of organization of matter in nature
    c. The Ecosystem: definition, what makes it work?
        1. Components of ecosystems
        2. Abiotic and biotic components of ecosystems
        3. Energy flow in the ecosystem: food chains, food pyramids, food webs
        4. Biodiversity and stability of the ecosystem
        5. Succession in ecosystems
    d. Biogeochemical cycles:
        1. Carbon, nitrogen, phosphorous and hydrologic cycles
        2. Impact of man on these cycles
    e. Biogeography
        1. Terrestrial
        2. Aquatic
    f. Evolution and biodiversity
        1. Natural selection
        2. Ecological niches
        3. Speciation
        4. Extinction
    g. Sustaining wild species
3) Community Ecology
    a. Community structure
        1. Stratification
        2. Species diversity
    b. Roles of species (indicator, native, non-native)
    c. Symbiotic interactions among species
4) Population Ecology
    a. Population dynamics
        1. Exponential vs. linear growth

2. Carrying capacity
3. Minimum viable population
4. Predation
5. Competition
6. Reproductive patterns

5) Human Population Problems
   a. Population dynamics
   b. Age structure pyramids
   c. Family planning and population control
6) Water Resources and Water Pollution
   a. Surface and ground water
   b. Sustainable water use with specific application to California
   c. Environmental irrigation
   d. Point vs. non-point sources
   e. BOD (biological oxygen demand) vs. DO (dissolved oxygen)
   f. Eutrophication, oligotrophication
   g. Issues related to groundwater, streams, lakes and oceans
   h. Sewage treatment
7) Geology, Non-renewable and Renewable Energy Sources, and the Energy Crisis
   a. Geological processes
   b. Soil formation, erosion and degradation
   c. Formation and extraction of non-renewable resources
   d. Fossil fuels: analysis of depletion; impact of production of energy from fossil fuel
   e. Hydroelectric energy
   f. Solar energy
   g. Nuclear fission
8) Air and Air Pollution
   a. Assaying the hazards of air pollution
   b. Major sources of air pollution
   c. Hazards of air pollutants: carbon monoxide, sulfur oxides, hydrocarbons, nitrogen oxides, photochemical smog, particulate matter
9) Climate Change and Ozone Loss
   a. Natural greenhouse effect
   b. Factors affecting changes in the Earth's average temperature
   c. Effects of a warmer world
   d. Ozone depletion: causes and effects
10) Forests
   a. The forest ecosystem
   b. History of abuse and depletion
   c. Forest management and conservation
11) Toxicology and Human Health

Course Objectives

Students will be able to:

1) Outline and apply the scientific method to the analysis and resolution of environmental problems.
2) List a variety of natural resources and describe how they are connected with environmental issues.
3) Define the concept of sustainability.
4) Compare and contrast the fields of ecology and environmental science.
5) List the root causes of environmental problems, examine their interconnections, and discuss their connections to political, economic and social issues.
6) Describe the major effects that hunter-gatherer, agricultural, and industrial societies have had on the environment.
7) List the major components of an ecosystem, define ecosystem services and describe how they affect the sustainability of the Earth's life support services.
8) Model earth's biogeochemical cycles and explain their interconnections with environmental issues.
9) Analyze how utilization of non-renewable energy sources impacts the natural environment and evaluate and recommend energy alternatives.

10) Diagram a sample food web and describe its relationship to energy flow in an ecosystem.
11) Describe how species interact via competition and predation and model the impacts on population size.
12) Explain the relationship between changes in a population's gene pool through successive generations and the process of evolution.
13) Explain how the extinction of species and formation of new species affect biodiversity and the overall impact on Earth's sustainability.
14) Model how populations change in size, density and makeup in response to birth, death, fertility, migration rates and environmental stress.
15) Describe the scientific basis behind soil, water and air resources, describe associated issues with each of them, and evaluate methods for remediation and prevention of future problems.
16) Evaluate the relationships between humans and their environment and assess the impact of humans on Earth's natural systems.

Method of Evaluation
A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.
1) Quizzes and exams (objective, essay) that measure students' ability to recognize and explain the patterns, processes and relationships associated with Earth's natural systems, and the impact of man on these systems.
2) Research projects in which students are required to analyze, interpret and draw conclusions from scientific sources.
3) Written assessment of data collected and analyzed from field trip which demonstrates students' ability to understand and apply scientific reasoning and methodology.

Special Materials Required of Student
None

Minimum Instructional Facilities
Smart classroom

Method of Instruction
1) Integrated classroom lecture, discussion and demonstration
2) Small and large group discussion, interactive problem solving
3) In-class activities and independent homework and/or research problems
4) Field trip(s)
5) Auxiliary use of study groups, peer tutoring and/or instructional office hours

Out-of-Class Assignments
1) Assignments that require students to identify and describe key course concepts or solve problems related to course concepts
2) Research projects that require students to analyze various scenarios relevant to environmental issues

Texts and References
1) Required (representative examples):
   a. Hassenzahi, Hager, Gift, Berg & Raven. Environment. 10th edition. Wiley. 2018. ISBN 978-1-119-39341-2
   b. Miller, G. Tyler and Scott Spoolman. *Environmental Science, 16th edition.* Cengage Learning, 2019. ISBN-13: 978-1337569613
2) Supplemental: as assigned by instructor

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1) Outline and apply the method of scientific inquiry to the analysis and resolution of environmental issues.
2) Analyze and interpret quantitative, qualitative and visual representations of data as applied to the analysis and resolution of environmental issues.
3) List the root causes of major global, regional and local environmental issues, examine their interconnections, and discuss their connections to legal, political, economic and social systems and issues.
4) Analyze the scientific basis of major environmental issues surrounding biodiversity, renewable and non-renewable energy, sustainability, climate change, soil, water and air resources, and solid and hazardous waste management, and describe associated issues with each of them, and evaluate methods for remediation and development of possible solutions and prevention of future issues.
5) Evaluate and describe the relationships between humans and environmental issues, assess the impact of humans on Earth's natural systems, and examine the impacts of environmental issues on human populations.