

## **Environmental Science ECE**

### **Course Description**

Environmental Science Early College Experience (ECE) provides students with a comprehensive study of the fundamentals of Environmental Science. Students examine biological and physical characteristics of the Earth and the impact of human interactions on ecosystems, climates, and natural resources. In addition, they evaluate the complexity of sustainable solutions. Independent work and diligence in meeting deadlines are important factors towards success in this ECE course.

The course aligns with the *Portrait of the Crusader* by encouraging students to think both critically and creatively in order to solve problems. In addition, students are encouraged to work collaboratively, demonstrate respect for others, take responsibility for individual and group work, and demonstrate integrity in all activities.

### **Essential Questions for the Course**

- What are the ways that humans impact the environment?
- What is biodiversity and why is it important for human survival?
- How does climate influence the levels of biodiversity?
- What is climate change and how do we address it?
- What are the global impacts of pollution?
- What is renewable energy and how is it being utilized today?
- What is the connection between the environment and disease?

## Course Curriculum

### Unit I. Introduction to Environmental Science

Weeks 1 - 4

#### Focus Questions:

- What does Environmental Science encompass?
- What are the ways that humans impact the environment?
- What steps can we take to limit negative environmental impacts?

#### Concepts/Skills:

- Discuss the big ideas of environmental science and the range of topics researched by environmental scientists, from wildfires to Covid 19.
- Examine the human activity that is most disruptive to the environment: (1) Depletion - resource depletion, deforestation, land habitat destruction, marine ecosystem depletion; (2) Pollution - land, air, and water pollution, agricultural practices and soil degradation, waste generation; (3) Use of non-renewable energy sources and climate change.
- Analyze the factors that impact the human population.
- Evaluate theories of global population growth, including Malthusian Theory.

#### Assessments:

- Terminology and comprehension quizzes
- Unit Test

### Unit II. Biodiversity, Conservation, Ecosystems, Biomes, and Ecology

Weeks 5 - 10

#### Focus Questions:

- What is biodiversity and why is it essential for human survival?
- How does geographic location affect levels of biodiversity?
- What are the major biomes? Ecosystems?
- How do biotic and abiotic factors interact to create a healthy system?
- What is ecological tolerance and how do environmentalists measure this?
- What causes the extinction of a species?
- What steps have been taken in various regions to protect biodiversity?

#### Concepts/Skills:

- Explain why biodiversity is critical to the healthy functioning of biomes/ ecosystems.
- Define the different scales of biodiversity and analyze the consequences of healthy and diminished biodiversity of each scale.
- Analyze the correlation between geographic location/water and biodiversity levels.
- Describe the major ecosystems and biomes on Earth.
- Analyze how biotic and abiotic factors interact to create a healthy system.
- Explain flow of energy in an ecosystem, trophic level transfer efficiency, and trophic cascade.

- Examine ecological tolerance and the impact of environmental factors on reproduction.
- Review causes and effects of specific extinctions.

**Assessments:**

- Biodiversity Scales Presentation
- Biogeography quiz
- Exam - Units 1 and 2

**Unit III: Earth's Atmosphere, Global Wind Patterns, Radiation, Seasons**

**Weeks 11 -14**

**Focus Questions:**

- What factors drive climate conditions on Earth?
- How do changes to one factor impact other factors?
- Why is the ocean our greatest ally in preventing rapid climate change?
- What methods do environmental scientists use to address climate issues?
- What is the purpose of carbon sequestering?

**Concepts/Skills:**

- Examine the factors that influence climate on Earth: solar radiation; Earth's orbit, rotation and tilt (the seasons); the atmosphere and greenhouse gasses; volcanic eruptions; ocean currents; land masses; and the Rain Shadow Effect.
- Explain how each layer of the Earth's atmosphere is formed and the purpose of each layer; examine the impact of greenhouse gasses.
- Examine the factors that drive ocean currents and analyze how the Coriolis Effect deflects the atmosphere and ocean water in the Northern and Southern Hemispheres.
- Model and explain the causes and effects of El Nino and La Nina including the long term environmental impacts on land and oceans.
- Explain the Rain Shadow Effect and where this occurs in the United States.
- Examine the causes and effects of the California droughts.
- Analyze methods for carbon sequestering.
- Explain the purpose of soil analysis charts and interpret sample charts for supporting problem-solving.

**Assessments:**

- Video analysis (Earth Development)
- Free Response Writing - Practice AP
- Quiz based upon terminology and concepts of the unit

## Unit IV: Agriculture, Land Resources, Geological Processes

Weeks 15 - 18

### Focus Questions:

- How does climate and climate change play a role in agricultural techniques and crop yields?
- What effects has large-scale agriculture had on the natural resources found on Earth?
- What are GMOs and what impact do they have on the environment? Human health?
- What is the Green Revolution?
- How are aquifers used to irrigate land for farming?
- How have mining practices impacted the environment?
- How has urbanization impacted the environment?
- What is your ecological footprint?

### Concepts and Skills:

- Examine agricultural practices and methods to improve farming to lessen harmful effects on the environment.
- Explain how crops are genetically modified and examine the pros and cons of this process in 2024 and beyond.
- Analyze the effects that large scale agriculture has on land and water resources.
- Examine the different types of mining and their impacts on the environment.
- Examine how urbanization impacts fresh water extraction, air and water quality, waste disposal on land and in water, and energy consumption and the Earth's carbon footprint.
- Explain the concept of sustainability, including the terms *impact of extraction* and *rate of replenishment*.

### Assessments:

- GMO Debate
- Quizzes on terminology and concepts of the unit
- Urbanization Shark Tank Project
- Exam - Units 3 & 4

## Unit V. Environment and Disease

Weeks 19 -21

### Focus Questions:

- How does the environment impact the causes and spread of disease?
- What is the connection between population density and disease?
- How do pollution and climate disasters contribute to disease and the spread of disease?

### Concepts/Skills:

- Explain the various pathogens and how pathogens have evolved specific mechanisms for infecting humans: direct contact, inhalation and ingestion.
- Explain the genetic and environmental components of disease.

- Discuss modern infectious diseases and their spread; examine the causes and effects of the most significant pandemics caused by pathogens, including Covid.
- Analyze how climate impacts the development and spread of disease.
- Examine the effect of pollution on human health.
- Discuss how socio-economic factors and education impact the spread of disease.

**Assessments:**

- Quizzes on terminology and concepts of the unit
- Case Study Project

**Unit VI: Energy, Energy Consumption, and Pollution**

**Weeks 22 - 25**

**Focus Questions:**

- How much energy do we now consume in the United States?
- What is the difference between renewable and nonrenewable resources?
- How do non-renewable energy sources cause air, land, and water pollution?
- What are the benefits, pitfalls, and challenges to nuclear and alternative energy programs?
- What steps has the U.S. taken to reduce pollution, including acid rain?

**Concepts/Skills:**

- Review energy consumption in the United States over time.
- Differentiate between renewable and non renewable energy sources and their availability.
- Evaluate the pros and cons of nuclear energy.
- Analyze the future impacts of continued reliance on non-renewable resources.
- Explain the relationship between thermal inversion and pollution.
- Explain the impact of acid rain and the steps implemented to address its causes in North America and Europe.
- Evaluate the feasibility of specific renewable resources.
- Research the pros and cons of ecotourism in the US and abroad. Examine successful approaches to ecotourism and what society can do to promote sustainable ecotourism.

**Assessments:**

- Quizzes on terminology and concepts of the unit
- Energy Project

**Final Exam**

**Note:**

- A week-by-week syllabus/timeline is given to all students at the beginning of the year. This syllabus has been submitted to UCONN for approval as an ECE Environmental Science course.

**Grading Policy:**

- Grading will be based on a points system.