AP® Environmental Science

Syllabus 3

Course Description

AP® Environmental Science is designed to prepare students for the College Board AP Environmental Science Exam. The course meets seven periods a week, which includes two sets of double lab periods, for a full year. G. Tyler Miller's *Living in the Environment: Principles, Connections, and Solutions,* 12th edition, Brooks/Cole/Thomson Learning, will be used.

Students have access to seven classroom computers with Internet connections as well as additional laptop computers. Graphing and statistics are performed using Excel. Standard laboratory equipment, such as microscopes, balances, Bunsen burners, and glassware, is also available. The high school campus consists of fields, a 30-year-old forest, and an abandoned apple orchard, all of which will be utilized in the course of appropriate field studies. Students will maintain a permanent, bound lab notebook recording their lab experiences.

Students will be assessed using a variety of methods, including weekly quizzes, monthly unit tests, lab write-ups, oral reports, and textbook homework. In addition, students will prepare biweekly environmental science current event reports and perform eight hours of environmentally related community service.

Note: In the curriculum below, Roman numerals and letters in red listed in the Proficiencies column refer to the AP Environmental Science Outline.

Course Proficiencies
2006–2007

1.	Demonstrate a working knowledge of lab safety rules and procedures.	
2.	Apply the steps of the scientific method to laboratory and field investigations.	**[C8]**
3.	Outline the flow of energy and the cycling of matter within the natural Earth's system.	**[C2]**
4.	Explain the relationships among plate tectonics, earthquakes, and volcanism.	**[C1]**
5.	Outline the rock cycle and its relationship to soil formation.	**[C1]**
6.	Construct a food web showing interrelationships among organisms in an ecological community.	**[C2]**
7.	Describe and analyze population growth, including the dynamics of human populations.	**[C3]**
8.	Explain the factors that lead to the endangering of species and the loss of biodiversity.	**[C3]**
9.	Describe the problems associated with agriculture and food production in today's world.	**[C4]**
10.	Identify renewable and nonrenewable resources, including distribution, ownership, use, and degradation.	**[C1]**
11.	Discuss the state of the atmosphere in terms of weather, climate, air pollution, ozone, and greenhouse gases.	**[C1, C7]**
12.	Analyze the environmental quality of air, soil, and water.	**[C6]**
13.	Explain how usable energy is generated from fossil fuels, nuclear fuels, and alternative sources and the tradeoffs associated with their use.	**[C5]**
14.	Outline the processes involved in water and sewage treatment.	**[C4]**
15.	Identify the problems associated with the disposal of solid and toxic wastes.	**[C6]**
16.	Identify global changes and their consequences.	**[C7]**
17.	Explain environmental problems in relationship to scientific, social, legal, cultural, and economic factors.	**[C10]**
18.	Relate course topics to local problems faced by New Jersey residents.	
19.	Demonstrate an awareness of careers related to environmental science.	
20.	Discuss the effects of environmental quality on human health.	**[C10]**

C8—The course provides students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world. The curriculum draws upon various scientific disciplines.

C2—The course provides instruction in The Living World.

C1—The course provides instruction in Earth Systems and Resources.

C3—The course provides instruction in Population.

C4—The course provides instruction in Land and Water Use.

C7—The course provides instruction in Global Change.

C6—The course provides instruction in Pollution.

C5—The course provides instruction in Energy Resources and Consumption.

C10—The course teaches students how to identify and analyze environmental problems, to evaluate the ecological and human health risks associated with these problems, and to critically examine various solutions for resolving or preventing them.

Advanced Placement Environmental Science Curriculum: Unit 1	
Proficiencies	1, 2, 3 (V A)
NJCCCS	
Scope and Sequence	**Unit 1: Overview of Environmental Science** Chapter 1: Environmental Issues Experimentation and Statistics Chapter 2: Environmental History Chapter 3: Science, Systems, Matter, and Energy **[C8]**
Instructional Activities	1. Class Discussions, Cooperative Groups, Internet Search, Assigned Readings 2. Lab: Parking Lot Ecology—Student-Designed Investigation **[C11]** 3. Group Presentations 4. Chi-Square Statistic **[C9]** 5. Activity: Tragedy of the Commons
Timeline	3 Weeks
Evaluation Methods	Tests Quizzes Formal Lab Report Lab Notebook Cooperative Learning Projects Teacher Assessment

C8—The course provides students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world. The curriculum draws upon various scientific disciplines.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

C9—The course includes methods for analyzing and interpreting information and experimental data, including mathematical calculations.

Advanced Placement Environmental Science Curriculum: Unit 2	
Proficiencies	1, 2, 3, 6, 8 (II A-E, I B)
NJCCCS	
Scope and Sequence	**Unit 2: Ecosystems and Biodiversity** Chapter 4: Ecosystems: Components, Energy Flow, and Matter Cycling Chapter 5: Evolution and Biodiversity: Origins, Niches, and Adaptation Chapter 6: Biogeography: Climate, Biomes, and Terrestrial Biodiversity **[C2]**
Instructional Activities	1. Class Discussions, Cooperative Learning Activities, Internet Searches, Teacher Lectures 2. Lab: GPS and Mapping Abiotic Factors of the Old Apple Orchard 3. Lab: Interspecific and Intraspecific Interactions 4. Lab: Aquarium Nitrogen Cycle **[C11]** 5. Long-Term Investigation: Biocolumns 6. Lab: Measuring Biodiversity with the Shannon Index **[C9]**
Timeline	5 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C2—The course provides instruction in The Living World.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

C9—The course includes methods for analyzing and interpreting information and experimental data, including mathematical calculations.

Advanced Placement Environmental Science Curriculum: Unit 3	
Proficiencies	1, 2, 6, 7, 8 (I C, II A, III A, IV B)
NJCCCS	
Scope and Sequence	**Unit 3: Biodiversity, Populations, and Communities** Chapter 7: Aquatic Ecology: Biodiversity in Aquatic Systems Chapter 8: Communities Chapter 9: Populations **[C2, C3]**
Instructional Activities	1. Class Discussions, Lecture, Cooperative Groups, Internet Search, Assigned Readings 2. Lab: Forest Quadrat Study 3. Field Trip Options: Great Swamp, Sandy Hook 4. Biome Fair 5. Lab: Succession 6. Lab: Estimating Population Size of Daphnia 7. Lab: Population Sampling Using Hayden and Zippen's Methods **[C 11]** 8. Video: *Aquatic Life Zones*
Timeline	3 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C2—The course provides instruction in The Living World.

C3—The course provides instruction in Population.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

Advanced Placement Environmental Science Curriculum: Unit 4	
Proficiencies	1, 2, 4, 5 (I A, D)
NJCCCS	
Scope and Sequence	**Unit 4: Geology** Chapter 10: Geology: Processes, Hazards, and Soils **[C1]**
Instructional Activities	1. Class Discussions, Cooperative Learning Activities, Internet Searches, Teacher Lectures 2. Virtual Lab: Plate Tectonics 3. Virtual Earthquake Lab 4. Lab: Chemical and Physical Properties of Soils 5. Student-Designed Lab: Soil Salinization's Effect on Seed Germination **[C11]**
Timeline	2 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C1—The course provides instruction in Earth Systems and Resources.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

Advanced Placement Environmental Science Curriculum: Unit 5	
Proficiencies	1, 2, 7, 10, 17, 18 (III B, IV D)
NJCCCS	
Scope and Sequence	**Unit 5: Human Population** Chapter 11: The Human Population: Growth, Demography, and Carrying Capacity **[C3]** Chapter 25: Sustainable Cities: Urban Land Use and Management **[C4]**
Instructional Activities	1. Class Discussions, Cooperative Learning Activities, Internet Searches, Teacher Lectures 2. Field Trip: Cemetery Population Study 3. Population Demonstrations 4. Data Analysis Lab: Human Population Trends **[C11]** 5. Cooperative Groups: Shopping Center Planning 6. Video: *The Population Paradox*
Timeline	2 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C3—The course provides instruction in Population.

C4—The course provides instruction in Land and Water Use.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

Advanced Placement Environmental Science Curriculum: Unit 6	
Proficiencies	1, 2, 9, 10, 13, 17, 18, 19 (IV A, C, F IV C, V E IV E V B, C, D V F, G)
NJCCCS	
Scope and Sequence	**Unit 6: Resources** Chapter 12: Food Resources **[C1]** Chapter 13: Water Resources Chapter 14: Geologic Resources: Nonrenewable Mineral and Energy Resources Chapter 15: Energy Efficiency and Renewable Energy **[C5]**
Instructional Activities	1. Class Discussions, Cooperative Learning Activities, Internet Searches, Teacher Lectures 2. Problem-Based Learning: Genetically Based Foods 3. Activity: Drawing Topographic Maps 4. Activity: Surface Mining Simulation 5. Field Trip: Franklin Mine, Fish Hatchery *6.* Video: *Harvest of Fear* 7. Debate: The Dam Problem **[C10]** 8. Calculations: Energy Conversions **[C9]** 9. Home Energy Consumption Audit **[C5]** 10. Video: *Exxon Valdez* 11. Solar Energy, Solar Oven Design Lab **[C11}**
Timeline	4 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C1—The course provides instruction in Earth Systems and Resources.

C5—The course provides instruction in Energy Resources and Consumption.

C10—The course teaches students how to identify and analyze environmental problems, to evaluate the ecological and human health risks associated with these problems, and to critically examine various solutions for resolving or preventing them.

C9—The course includes methods for analyzing and interpreting information and experimental data, including mathematical calculations.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

Advanced Placement Environmental Science Curriculum: Unit 7	
Proficiencies	1, 2, 8, 11, 12, 14, 16, 18, 20 (IV B, C VI A 1+2 I B, VII A, B VI A 3)
NJCCCS	
Scope and Sequence	**Unit 7: Pollution** Chapter 16: Risk, Toxicology, and Human Health **[C10]** Chapter 17: Air and Air Pollution **[C6]** Chapter 18: Climate Change and Ozone Loss **[C7]** Chapter 19: Water Pollution **[C6]**
Instructional Activities	1. Class Discussions, Cooperative Learning Activities, Internet Searches, Teacher Lectures 2. Lab: Monitoring Air Pollution (Particulates, Ozone, and Lichen Survey) 3. Lab: Acid Deposition **[C11]** 4. Video: *An Inconvenient Truth* 5. Data Analysis labs: CO_2 Levels, Global Temperature Trends 6. Computer Labs: Ozone Hole, El Nino Prediction **[C11]** 7. Activity: The Ozone Show 8. Field Trip: Sewage Treatment Plant 9. Labs: Oil Spill Bioremediation, Water Quality Testing, Groundwater Pollution Assessment, Effect of Biodegradable Materials on Dissolved Oxygen **[C11]**
Timeline	4 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C10—The course teaches students how to identify and analyze environmental problems, to evaluate the ecological and human health risks associated with these problems, and to critically examine various solutions for resolving or preventing them.

C6—The course provides instruction in Pollution.

C7—The course provides instruction in Global Change.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

Advanced Placement Environmental Science Curriculum: Unit 7 (continued)	
Proficiencies	1, 2, 15, 20, 17, 18, 19 (IV A2 VI B2)
NJCCCS	
Scope and Sequence	**Unit 7: Pollution (Continued)** Chapter 20: Pesticides and Pest Control Chapter 21: Solid and Hazardous Waste **[C6]**
Instructional Activities	13. Simulation Lab: A Natural Arsenal 14. Labs: Determination of LD50, Making Paper, Testing Plastics **[C10, C11]** 15. Simulation: Solid Waste Disposal (Landfills) 17. Video: *What Happened to the Water?* Field Trip: Landfill and Sewage Treatment Plant
Timeline	2 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C6—The course provides instruction in Pollution.

C10—The course teaches students how to identify and analyze environmental problems, to evaluate the ecological and human health risks associated with these problems, and to critically examine various solutions for resolving or preventing them.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

Advanced Placement Environmental Science Curriculum: Unit 8	
Proficiencies	8, 10, 17, 18, 19 (VII C IV B, D)
NJCCCS	
Scope and Sequence	**Unit 8: Conservation** Chapter 22: Sustaining Wild Species Chapter 23: Sustaining Terrestrial Biodiversity: the Ecosystem Approach **[C10]** Chapter 24: Sustaining Aquatic Biodiversity
Instructional Activities	1. Class Discussions, Cooperative Learning Activities, Internet Searches, Teacher Lectures 2. Research Activity: Extinction 3. Internet Activity: Nonnative Species 4. Cooperative Activity: What Price Open Space? 5: Optional Field Trip: New Jersey Aquarium 6. Labs: Habitat Fragmentation, Forestry
Timeline	3 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C10—The course teaches students how to identify and analyze environmental problems, to evaluate the ecological and human health risks associated with these problems, and to critically examine various solutions for resolving or preventing them.

Advanced Placement Environmental Science Curriculum: Unit 9	
Proficiencies	16, 17, 18 (VI C) (IV G)
NJCCCS	
Scope and Sequence	**Unit 9: Environment and Society** Chapter 26: Economics, Environment, and Sustainability Chapter 27: Politics, Environment, and Sustainability Chapter 28: Environmental Worldview, Ethics, and Sustainability **[C10]**
Instructional Activities	1. Class Discussions, Cooperative Learning Activities, Internet Searches, Teacher Lectures 2. Independent Study 3. Community Service 4. Current Events Folder 5. Guest Speakers (Environmental Action Groups, Township Officials, and Others) **[C10]**
Timeline	3 Weeks
Evaluation Methods	Tests Quizzes Lab Notebook Group Projects Teacher Assessment

C10—The course teaches students how to identify and analyze environmental problems, to evaluate the ecological and human health risks associated with these problems, and to critically examine various solutions for resolving or preventing them.

Advanced Placement Environmental Science Curriculum: Unit 10	
Proficiencies	1, 2, 18, 19
NJCCCS	
Scope and Sequence	**Unit 10: Exam Review and After**
Instructional Activities	1. Practice AP Exams 2. Independent Research 3. Community Service Project 4. Critical Evaluation of Media Portrayal of Environmental Issues
Timeline	5 Weeks
Evaluation Methods	Tests Lab Notebook Group Projects Teacher Assessment