Perris Union High School District
Course of Study

A. COURSE INFORMATION

Course Title:
Environmental Science
- ☐ New
- ☑ Revised

If revised previous course name if changed
N/A

Transcript Course Code/Number:
104441/104442
(To be assigned by Educational Services)

Subject Area:
- ☐ Social Science
- ☐ English
- ☐ Mathematics
- ☑ Laboratory Science
- ☐ World Languages
- ☐ Visual or Performing Arts
- ☐ College Prep Elective
- ☐ Other

Is this classified as a Career Technical Education course?
- ☐ Yes
- ☑ No

Grade Level
- ☐ MS
- ☐ HS
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ 8
- ☑ 9
- ☑ 10
- ☑ 11
- ☑ 12

Required for Graduation:
- ☐ Yes
- ☑ No

Meets UC/CSU Requirements?
- ☑ Yes
- ☐ No

Was this course *previously approved by UC* for PUHSD?
- ☐ Yes
- ☑ No
  (Will be verified by Ed Services)

Meets "AP" Requirements?
- ☐ Yes
- ☑ No

Submitted by:
Site:
Date:

Credential Required to teach this course:
Single Subject: Biological Sciences; Science: Geosciences; Science: Physics

To be completed by Human Resources only

Signature 2/14/24
Signature Date

Meets "Honors" Requirements?
- ☐ Yes
- ☑ No

Unit Value/Length of Course:
- ☐ 0.5 (half year or semester equivalent)
- ☑ 1.0 (one year equivalent)
- ☐ 2.0 (two year equivalent)
- ☐ Other:

CALPADS CODE:
9339

Approvals	Name/Signature	Date
Director of Curriculum & Instruction		02/29/2024
Asst. Superintendent of Educational Services	Kindy Lee Mackenzie	03/08/2024
Governing Board		

Prerequisite(s) (REQUIRED):
None
Corequisite(s) (REQUIRED):
Algebra I
Brief Course Description (REQUIRED):
Environmental Science provides students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, identify and analyze environmental problems both natural and human-made, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. Environmental science is interdisciplinary, embracing topics from geology, biology, environmental studies, environmental engineering, chemistry, demography, economics, ethics, political science and geography. This course will be project based, including strong laboratory and field investigation components. Experiences both in the laboratory and in the field provide students with opportunities to test concepts and principles that are introduced in the classroom. In this class, students gain a broad awareness of environmental science, related career opportunities and become better global citizens.

B. COURSE CONTENT

Course Purpose (REQUIRED):
What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Note: More specificity than a simple recitation of the State Standards is needed.

Environmental Science is a multidisciplinary course that draws from all other sciences. including but not limited to, chemistry, biology, ecology, geography and Earth sciences, to help achieve practical goals. Such goals include the conservation and protection of natural resources on local, state and global levels through environmental education and research. Environmental science helps us to understand the connection between humans and the world in which we live. This course will allow students to identify and analyze environmental problems both natural and man-made, identify threats associated with these problems, and develop valid solutions to prevent these problems from reoccurring. Laboratory investigation and analysis as well as projects are an integral part of this course.

Students will:

1. Utilize scientific tools and instruments used in environmental studies to explore, understand and conduct experiments.

2. Understand how energy and matter moves and transforms through biological and chemical cycles.

3. Learn. describe and identify how natural and anthropological processes impact the composition and characteristics of the environment.

4. Study consumption of resources and assess sustainability of both renewable and non-renewable resources .

5. Apply environmental science concepts to specific situations, locations, or events observed and encountered in everyday life.

6. Create and interpret graphical data through observations and lab experiments.

7. Develop and evaluate an experiment to answer a problem related to environmental science.

8. Participate in field work where they experience concepts discussed in class, collect data and document observations in a field journal.

Course Outline (REQUIRED):
Detailed description of topics covered. All historical knowledge is expected to be empirically based, give examples. Show examples of how the text is incorporated into the topics covered.

Unit 1: Studying the Environment

- Explore the tools of how environmental science is studied.
- Use graphs, charts, maps, and concept maps to model environmental concepts.
- Apply specific results and data to formulate valid conclusions.
- Understand how experimentation can help give clever insights into what is happening in the environment.
- Apply different areas of science (example Chemistry,Biology, Geosciences etc.) to study the environment.
- Students will learn the history of environmental science, how it connects with other disciplines, and sustainability.

Unit 2: Ecology and the Natural World

- Students are introduced to evolution, biodiversity, the levels of ecological organization, population ecology and the conservation of biodiversity. They then study species interactions, ecological communities and the earth's biomes.
- Students will review earth's environmental systems, ecosystems, biogeochemical cycles and geological systems. They will then study soil and its foundation, degradation and conservation.
- Students will understand how different forms of life affect the environment.
- Students will characterize the organization of life in the environment.
- Identify how organisms interact with each other.
- Students will show how energy and matter flow throughout an ecosystem.
- Understand that different areas of the world form biomes and the characteristics of biomes are shaped by the biotic and abiotic factors of that biome.
- Characterize the world's biomes and the forms of life that reside there.
- Understand biodiversity and why it is important.
- Recognize the threats to biodiversity and formulate solutions for habitat conservation.
- Define Population and understand what drives population increases and population decreases (births, deaths, emigration, and immigration).
- Recognize trends on population graphs.
- Identify factors that can affect population trends.

Unit 3: Resources from the Air, Water, and Land

- Students learn about the atmosphere, outdoor air pollution and indoor air pollution. They then learn about global climate change and how it connects with all the other topics we have studied this year.
- Students learn about nonrenewable fossil fuels (coal, oil, natural gas, tar sands, etc), their impacts (environmental, political and economical) and energy conservation. They will then move to alternatives (nuclear, biomass & hydrothermal) and how they compare with fossil fuels. They will then end by learning about renewable energy alternatives (solar, wind, geothermal, ocean and hydrogen) and how they compare to fossil fuels and our energy alternatives.
- Students learn about freshwater resources, human impact, pollution and its control, wastewater and its treatment, and freshwater conservation. They will then turn their focus to saltwater and learn about oceans, marine and coastal ecosystems, human use and impact, emptying the oceans and marine conservation.
- Students will learn about resource management, forestry, agricultural land use, parks and reserves. They will then learn about urbanization, sprawl, creating livable cities and urban sustainability.

Unit 4: Sustainability and Environmental Policy

- Students learn about environmental health and toxicology by studying the different effects of different toxins, risk assessment and management and ways to approach these risks.

- Students learn about waste management with approaches to it focusing on municipal, industrial and hazardous waste.
- Identify and explain social, biological , and chemical hazards in the environment.
- Identify sources and formulate solutions for toxins and hazardous chemicals in the environment.
- Students will learn about Biomagnification in terms of its effects on organisms including humans.

Writing Assignments (REQUIRED):
Give examples of the writing assignments and the use of critical analysis within the writing assignments.

Students will be required to perform various writing assignments:

- Lab Reports including all steps of the scientific method
- Short answer questions and responses relating to subject material
- Vocabulary descriptions
- Critical thinking prompts relating to current science research
- Reading and writing relating to science
- Note taking
- Current Events

INSTRUCTIONAL MATERIALS (REQUIRED)

Textbook #1	
Title: Principles of Environmental Science Bundle with 8 year update and lab manual	Edition: 1e
Author: William & Mary Ann Cunningham	ISBN: MHID: 0077037480 | ISBN 13: 9780077037482
Publisher: McGraw-Hill	Publication Date: 2023
Usage: ☑ Primary Text ☐ Read in entirety or near	

Textbook #2	
Title:	Edition:
Author:	ISBN:
Publisher:	Publication Date:
Usage: ☐ Primary Text ☐ Read in entirety or near	

Supplemental Instructional Materials *Please include online, and open source resources if any.*
CK12 Biology-Ecology Unit HHMI BioInteractive Edpuzzle Environmental Inquiry Learn Genetics- Ecology Education and the Environment Initiative Biogeochemical Cycles Genetically Modified Food Electronic Waste Recycle Tragedy of Commons Simulation

Estimated costs for classroom materials and supplies (REQUIRED). *Please describe in detail.* If more space is needed than what is provided, please attach backup as applicable.	
Cost for class set of textbooks: $ 6300.00	Description of Additional Costs: Shipping, lab materials, etc. This is for an 8 year bundle with updates for the textbook and materials
Additional costs:$ 400.00 (lab consumables)	
Total cost per class set of instructional materials:	$ 6700.00

Key Assignments (REQUIRED):
Please provide a detailed description of the Key Assignments including tests, and quizzes, which should incorporate not only short answers but essay questions also. How do assignments incorporate topics? Include all major assessments that students will be required to complete.
Parking Lot Lab - students use the student parking lot and the staff parking lot to determine the biodiversity, species richness and evenness of both "populations." Bird Beak Lab - survival of the fittest lab where students are given different "beaks" to compete for different "foods." They then roll a di and are given an environmental stressor in which they hypothesize the outcome then run the "test." Owl Pellet Lab- Students will dissect the owl pellets assigned to them. Using the forceps and skeletal charts, students will identify the contents of the pellet, sort bones into groups and finally record the types of animals found into a data table. Plate Tectonics Lab - Students demonstrate mastery of the three different plate boundaries and locate places where all can be found. Soil Lab - Students determine the health of a soil sample they bring to school by measuring N, K, pH, Ca, & Mg.

Bio Bottle Project - students will work in groups to create a double biome system where a the terrestrial system is connected to an aquatic ecosystem. Students will use at least 2 2-L bottles to construct a working ecosystem with producers, consumers and decomposers which will be sealed/airtight for at least 2 weeks. They will create an entire lab write up for this project.

LD50 Salinity Lab - students will grow mung beans in varying concentrations of salt water for two weeks to determine the LD50 of salt on mung bean growth.

Kill-A-Watt Lab - students use a kill-o-watt device to determine how effective their electronic devices are. They will also evaluate their energy audit findings to their actual electricity bill.

Oil spill clean up Lab-Students create a model of an ocean spill in a large bowl and 10 ml of vegetable oil. They make observations, and then devise a plan to clean up the spill. They have tools at their disposal, such as straws for booms. They attempt to recapture the 10 ml of oil. The best teams will present their results.

Endangered Species/Invasive Species Project - Students will create a children's story about an endangered species of their choice. Alternatively they can create a "KEEP OUT!" Invasive Species PSA poster/video/presentation

My Friend the Rat Video - shows the effects of a successful invasive species

How Wolves Change Rivers Video - shows how the reintroduction of wolves to Yellowstone impacted not only the biotic but abiotic factors of that area

Tragedy of the Commons Lab - Fishing simulation which introduces students to the key topic of tragedy of the commons which we connect with various other topics throughout the year

Apple Presentation - Using an apple, students get a visual of the importance of topsoil in feeding an entire planet.

Lorax movie - Students will watch the classic being who "speaks for the trees."

Years Living Dangerously - End of the Woods - students learn about the palm oil industry in Indonesia and raging fires in the US due to drought and climate change.

Years Living Dangerously - Fueling the Fire - Students learn about deforestation in the Brazilian rainforest and its connection with cattle ranchers.

Intro to Community Service Project - students will have all year to perform a community service project and write about how it connects with the topics we have learned in class.

Garbage Audit - Students will collect their garbage for a week and analyze what composes the majority of their rubbish as well as ways to reduce it.

Recycled Art Project - Students will create a work of art made entirely from recycled materials. They will be graded on both artistic and practical value. Projects will be displayed in a "Gallery Walk"

Energy Audit - Students will monitor their energy use for a week and look at ways they can conserve energy. They will also be given a several worksheets which remind them of how to solve questions based on dimensional analysis.

Years Living Dangerously - Winds of Change - students learn about the Heartland Institute and how politics connect with climate change, they also learn about the dangers of methane leaks in areas we assumed were not leaking methane.

Fukushima Video - Students watch the Nightline documentary on the Fukushima Daiichi Nuclear Power Plant Meltdown.

Turbine Competition - Students make their own pinwheels and try to create one that spins the fastest in the class

Solar Oven Project - Students create their own solar ovens to effectively melt marshmallows for smores. They have the opportunity to try cookies and more difficult items to cook later. A lab report will be submitted for this project

Food or Feeders: Food Web Investigation- Students compare two ecosystems based on the biodiversity of a coastal sage scrub ecosystem found in our county and a city park ecosystem, or an orange grove ecosystem found in our area. Students research each organism within the two ecosystems to ascertain their feeding relationships. Using this information, students create a food web poster based on the which organisms feed on the others. By comparing the two food webs, students will analyze the resistance to changes in the environment by the diversity within each community. Students present these posters to their classmates.

Plastic Free Shopping- Students "shop" virtually for non plastic alternatives for everyday plastic items

Racing Extinction Documentary- Student watch the documentary and answer questions about wildlife trafficking, extinction, CO2 pollution, and how people are working together to make a difference.

San Andreas Fault Field Study: Cajon Pass to Avenue S- Explore the fault, evidence of previous earthquakes, hazards,biogeography, adjacent urban areas and discuss risks and mitigation.

Coast to Cactus: Santa Rosa Plateau to Palm Desert; Geology, Biogeography, Geomorphic Provinces, Agriculture, Aqueduct/water systems, Climatology, Biomes, Population Distribution

San Diego Safari Park Field Trip- Standards based field trips where students are able to simulate science practices that professional scientists use in the field of conservation addressing biodiversity loss and challenges

California Science Center Field trip- ECO EXPLORATIONS- Discover behind-the-scenes interactions with California Science Center animals, the people who take care of them, and the systems that help us keep them healthy.

Joshua Tree National Park Field Study Students will be provided the opportunity to learn how the threatened desert tortoise thrives and how park scientists keep track of the population. Students will track and take measurements of

"tortoises" in the wild (no live animals will be used.)
Location: Cap Rock Nature Trail, Black Rock Nature Center, or Cottonwood Campground

Eastern Municipal Water District: WasteWater Treatment Facility - This tour ranges from one hour to three and half hours depending on customizable options. The tour is of a reclamation facility located in San Jacinto, CA. Students will learn the process of turning wastewater into recycled water and address conserving limited resources like fresh water and water use issues

Instructional Methods and/or Strategies (REQUIRED):

Please list specific instructional methods that will be used.

The following methods and strategies for teaching the curriculum will be used during the course of instruction as appropriate for the each lesson: Project-based learning, field studies and lab investigations, collaborative learning opportunities, hands-on experience, student presentations, group and individual projects, peer coaching and student mentoring, use of community resources including guest speakers and field trips. Use of technology-based resources such as probe ware, water testing kits, and soil testing kits. Use of internet resources such as Phet Simulations, Learn Genetics, and Habitable Planet Simulations, among others will be utilized by students throughout the year.

Assessment Methods and/or Tools (REQUIRED):

Please list different methods of assessments that will be used.

During the course of the instructional year, assessment of student performance will include but will not be limited to:

1. Embedded assessments
2. Skill mastery and quality of work
3. Completion of assignments in a science journal
4. Data collection and maintenance of lab notebook with field notes
5. Individual projects/group projects/Group Presentations

COURSE PACING GUIDE AND OBJECTIVES (REQUIRED)

Week	Objectives & Lessons	NGSS Standard(s)	Chapter(s)	Reference/ Resources
1.1	**Unit 1: Studying the Environment** **Nature of Science** Science Helps Us Understand Our World Science and Engineering Tools Critical Thinking			

	Scientific Ethics			
1.2	**Understanding of our Environment** What Is Environmental Science? Major Themes in Environmental Science Human Dimensions of Environmental Science Where Do Our Ideas About the Environment Come From?	HS-LS2-2 HS-LS2-3 HS-ESS3-3 HS-ESS3-5		
1.3	**Unit 2: Ecology and the Natural World** **Environmental Systems: Matter, Energy, and Life** Systems Describe Interactions Elements of Life Energy and Living Systems	HS-LS1-1 HS-LS1-2 HS-LS1-3 HS-LS1-5 HS-LS1-6 HS-LS1-7 HS-LS2-3 HS-LS2-5 HS-LS2-6		Notes Edpuzzle-Ecology
1.4	From Species to Ecosystem Biogeochemical Cycles and Life Processes	HS-LS2-4 HS-ESS2-6		Edpuzzle-Biogeochemical Cycles
1.5	**Evolution, Species Interactions, and Biological Communities** Evolution Leads to Diversity: Species and Interactions	HS-LS3-1 HS-LS3-2 HS-LS4-1 HS-LS4-2 HS-LS4-3 HS-LS4-4 HS-LS4-5 HS-ESS2-7		Bird Beak Lab
1.6	Community Diversity Communities Are Dynamic to Change Over Time	HS-LS2-2 HS-LS2-6 HS-LS4-5		Food or Feeders: Food Web Investigation, Parking Lot Lab
1.7	**Population Dynamics** Population Growth Past and Current Population Growth Are Very Different Many Factors Determine Population Growth	HS-LS2-1 HS-LS2-2		
1.8	Fertility Is Influenced by Culture The Demographic Transition	HS-LS2-2 HS-LS2-7		

	What Kind of Future Are We Creating Now?			
1.9	**Biomes and Biodiversity** Terrestrial Biomes Marine Environments Freshwater Ecosystems	HS-LS2.A.1 HS-LS2-7 MS-LS2-1		Biomes Project
1.10	Biodiversity What Threatens Biodiversity? Biodiversity Protection	HS-LS2-7 HS-LS4-5 HS-ESS3-3		
1.11	**Unit 3: Resources from the Air, Water, and Land** **Climate** What Is the Atmosphere? Climate Changes Over Time	HS-ESS2-2 HS-ESS2-4 HS-ESS3-1		
1.12	How Do We Know Climate Is Changing Faster Than Usual? Envisioning Solutions	HS-ESS3-5 HS-ESS3-6		
1.13	**Air Pollution** Air Pollution and Health Air Pollution and Climate	HS-LS2-7 HS-ESS2-2		
1.14	Environmental and Health Effects Air Pollution Control	HS-ESS3-4		
1.15	**Water: Resources and Pollution** Water Resources How Much Water Do We Use?	HS-LS2-3 HS-ESS3-1		
1.16	Dealing with Water Scarcity Water Pollutants	HS-LS2-6 HS-LS2-7 HS-ESS3-3		
1.17	Water Treatment and Remediation	HS-ESS3-4		
2.1	**Land Use** World Forests Grasslands	HS-LS2-5 HS-ESS2-2 HS-ESS3-1		
2.2	Parks and Preserves	HS-ESS3-3		
2.3	**Food and Agriculture**	HS-ESS2-5		

	How Much Food Do We Need? What Do We Eat? Living Soil Is a Precious Resource Agricultural Inputs	HS-ESS3-3		
2.4	Global Trends in Food and Hunger How Have We Managed to Feed Billions? Sustainable Farming Strategies	HS-ESS3-1 HS-ESS3-4 HS-ESS3-D		
2.5	**Environmental Geology and Earth Resources** Earth Processes Shape Our Resources Minerals and Rocks	HS-ESS2-1 HS-ESS2-3		
2.6	Environmental Effects of Resource Extraction Geologic Hazards	HS-LS2-7 HS-ESS2-5 HS-ESS3-1 HS-ESS3-2 HS-ESS3-4		
2.7	**Energy** Energy Resources Energy Efficiency and Conservation Fossil Fuels	HS-ESS3-4		
2.8	Nuclear Power and Hydropower Wind and Solar Energy	HS-LS2-7		
2.9	Biomass and Geothermal Energy What does an energy transition look like?			
2.10	**Unit 4: Sustainability and Environmental Policy** **Environmental Health and Toxicology** Environmental Health Toxicology	HS-ESS3		
2.11	Movement, Distribution, and Fate of Toxins Toxicity and Risk Assessment			
2.12	**Solid and Hazardous Waste** What Waste Do We Produce? Waste Disposal Methods	HS-ESS3-4		
2.13	Shrinking the Waste Stream Hazardous and Toxic Wastes	HS-ESS3-2		

2.14	**Economics and Urbanization** Cities Are Places of Crisis and Opportunity Urban Planning Economics and Resource Management	HS-ESS3-1		
2.15	Natural Resource Accounting Trade, Development, and Jobs	HS-ESS3-2		
2.16	**Environmental Policy and Sustainability** Environmental Policy and Science Major Environmental Laws How are Policies Implemented? International Policies	HS-ESS3-1 HS-ESS3-3		
2.17	What can Students Do? The Challenges of Sustainable Development			Carbon Footprint- How Many Earths?

C. HONORS COURSES ONLY

Indicate how much this honors course is different from the standard course.
N/A

D. BACKGROUND INFORMATION

Context for course (optional)
Replacing current non-A-G course with a rigorous D, project and lab based course.
History of Course Development (optional)
This course was previously developed as a Life Science course that was not A-G approved. There is a high interest in Environmental Science topics, but the option for students up until this point was either take the non-college prep Environmental Science course or try to get into the Advanced Placement course if it is offered. This 2023 revision was done with the intent of converting this course to a project based lab course with greater rigor and with an interdisciplinary focus. The hope is that this revised course will be approved as a Lab Course (D) and, due to the interdisciplinary nature, will allow for flexibility in applying the course as either a life or physical science. This would result in an increase in students meeting the "D" requirement and getting closer to completing A-G, as well as bolster interest in science because of the high interest topics covered in the course. This course could be a bridge to prepare more students to explore the Advanced Placement Environmental Science or Dual Enrollment Biology.