

Livermore Valley Joint Unified School District

Course Title: CTE Environmental Resources A/B

Grade Level(s): 9 - 12

Length of Course: Two semesters or equivalent term

Credit: 10 units

Prerequisite: None

Co-requisite: None

Course Overview:

These courses are the introductory and concentrator courses for the Environmental Resources Career and Technical Education Pathway in the Energy, Environment, and Utilities Sector. The A Course is based on "Innovations in Green Technology," a course written with a grant from Pacific Gas and Electric Company by Strategic Energy Innovations. The B Course focuses on water, air, and land management.

Students who successfully complete both these courses, and go on to complete the capstone course, AP Environmental Science, will receive certificates of completion in the Environmental Resources Career and Technical Education Pathway. Thus, the addition of these two new courses creates a new CTE pathway in our District.

Schools Offering: Del Valle High School
Granada High School
Livermore High School
Vineyard High School

Meets University of California Entrance Requirements: Seeking "d" - Lab Science approval

Board Approval: Pending Board Approval

Course Materials: Lab Materials:
Model Solar Car Kits
USB Charger Kits
Hydrogen Fuel Cell Kits
Model Solar Water Heater Supplies
Water and Air Quality Monitoring Supplies

Supplemental Materials: Poster presentation-making supplies

CTE Environmental Resources A/B

COURSE CONTENT:

Unit 1: Solar Energy

Students will identify the characteristics of solar heated water design and installation. Students will explore uses of photovoltaic cells in charging mobile phones and powering small vehicles.

Summary of Key Assignments and/or Activities

Students will make a model solar water heater and test. They will test the solar water heaters outdoors and compare their results with other students. They will also make solar USB chargers and model solar cars.

Unit 2: Energy Efficiency and Conservation

Students will compare costs of alternate/renewable energy sources, systems, and appliances and traditional energy sources, systems, and appliances. Students will conduct an energy audit.

Summary of Key Assignments and/or Activities

Students will conduct a school wide energy audit. Students will share their findings and make posters to encourage energy conservation on campus.

Unit 3: Drinking Water Sources, Systems, Treatment, and Conservation

Students will understand water reuse: issues, strategies, technologies, and applications. Students will analyze strategies for improving energy efficiencies in water collection and distribution. Students will describe the role of environmental engineering and green energy in water systems. Students will understand the functions and operations of water storage, reservoirs, aqueducts, and dams.

Summary of Key Assignments and/or Activities

Students will collaborate with Zone 7 Water Agency and Cal Water as they design an environmentally-sustainable water delivery system for our Tri-Valley area.

Unit 4: Rivers, Groundwater, and Storm Water

Students will understand the designs and tools used in water flow management. Students will understand the principles and applications of drainage engineering. Students will use the Hydrologic Engineering Centers River Analysis System (HEC-RAS). Students will analyze water pollution sources. Students will describe the concerns and strategies for catastrophic storm water events and management.

Summary of Key Assignments and/or Activities

Students will create a local watershed model. Students will visit local arroyos and monitor their flow and water quality throughout the year.

Unit 5: Wastewater Management and Its Impact on the Environment

Students will understand the role of waste and storm water management systems, their operation, and their impact on the environment. Students will explore the causes and effects of pollution linked to wastewater treatment facilities. Students will identify wastewater treatment processes that lessen environmental impacts and improve water reuse.

Summary of Key Assignments and/or Activities

Students will visit our local wastewater treatment center, either virtually or in-person. Students will learn about careers in the field of wastewater treatment. Students will create a model of the flocking process in wastewater treatment.

Unit 6: Land Use Management and Its Potential for Environmental Impact

Students will describe the need for, and role of, habitat preservation. Students will describe the composition, role, and function of ecosystems, including trends affecting viability. Students will demonstrate the need for, and methods of, land use planning. Students will identify the aspects of land use planning and describe current trends. Students will summarize the relationship between land use planning and energy use and distribution. Students will explain the laws and regulations pertaining to land use planning. Students will develop strategies to maximize the effectiveness of land use planning.

Summary of Key Assignments and/or Activities

In collaboration with local land use management organizations, including Living Arroyos, Point Blue with their “Students and Teachers Restoring a Watershed” program, and Alameda County Resource Conservation District, students will participate in real-world, hands-on projects to help restore ecosystems.

Unit 7: Air Quality Management and Its Impact on the Environment

Students will understand the elements that create outdoor air quality. Students will summarize the causes of air pollutants and their chemical composition. Students will research air pollutants and their threat to human health. Students will understand U.S. and California laws and regulations related to air pollution control programs and health effects of air pollution. Students will describe the basic U.S. Environmental Protection Agency (EPA) and California Air Resources Board (ARB) roles and regulations

Summary of Key Assignments and/or Activities

In collaboration with our local air quality management organization, Bay Area Air Quality Management District, students will participate in real-world hands-on projects using tools designed for educational purposes for measuring air quality.

Unit 8: Careers in Energy and the Environment

Students will research green career opportunities. Students will take interest inventories to help identify careers that would be suitable for them. Students will interview professionals in their career(s) of choice to learn more about them.

Summary of Key Assignments and/or Activities

Students will create slide presentations or posters showcasing careers in which they are interested in pursuing. For hands-on experience with an environmental resources career in land and resource management, students will use the Riparian Bird Index on field trips to measure the long-term effects of restoration projects on our local arroyos.

Standards:**California Career Technical Education Model Curriculum Standards
for the Energy, Environment, and Utilities Sector:****Knowledge and Performance Anchor Standards**

1.0 Academics

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Energy, Environment, and Utilities academic alignment matrix for identification of standards.

2.0 Communications

Acquire, and accurately use Energy, Environment, and Utilities sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats. (Direct alignment with LS 9-10, 11-12.6)

- 2.1 Recognize the elements of communication using a sender–receiver model.
- 2.2 Identify barriers to accurate and appropriate communication.
- 2.3 Interpret verbal and nonverbal communications and respond appropriately.
- 2.4 Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format.
- 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- 2.6 Advocate and practice safe, legal, and responsible use of digital media information and communications technologies.

3.0 Career Planning and Management

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans. (Direct alignment with SLS 11-12.2)

- 3.1 Identify personal interests, aptitudes, information, and skills necessary for informed career decision making.
- 3.2 Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success.
- 3.3 Explore how information and communication technologies are used in career planning and decision making.
- 3.4 Research the scope of career opportunities available and the requirements for education, training, certification, and licensure.
- 3.5 Integrate changing employment trends, societal needs, and economic conditions into career planning.
- 3.6 Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society.
- 3.7 Recognize the importance of small business in the California and global economies.
- 3.8 Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates.
- 3.9 Develop a career plan that reflects career interests, pathways, and postsecondary options.

4.0 Technology

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Energy, Environment, and Utilities sector workplace environment. (Direct alignment with WS 11-12.6)

- 4.1 Use electronic reference materials to gather information and produce products and services.

- 4.2 Employ Web-based communications responsibly and effectively to explore complex systems and issues.
- 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
- 4.4 Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources.
- 4.5 Research past, present, and projected technological advances as they impact a particular pathway.
- 4.6 Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task.

5.0 Problem Solving and Critical Thinking

Conduct both short, and more sustained research to create alternative solutions to answer a question or solve a problem unique to the Energy, Environment, and Utilities sector using critical and creative thinking; logical reasoning, analysis, inquiry, and problem-solving techniques. (Direct alignment with WS 11-12.7)

- 5.1 Identify and ask significant questions that clarify various points of view to solve problems.
- 5.2 Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate.
- 5.3 Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment.
- 5.4 Interpret information and draw conclusions, based on the best analysis, to make informed decisions.

6.0 Health and Safety

Demonstrate health and safety procedures, regulations, and personal health practices, and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Energy, Environment, and Utilities sector workplace environment. (Direct alignment with RSTS 9-10, 11-12.4)

- 6.1 Locate and adhere to Material Safety Data Sheet (MSDS) instructions.
- 6.2 Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities.
- 6.3 Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies.
- 6.4 Practice personal safety when lifting, bending, or moving equipment and supplies.
- 6.5 Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics.
- 6.6 Maintain a safe and healthful working environment.
- 6.7 Review the responsibility of the Occupational Safety and Health Administration (OSHA) to ensure workplace safety.
- 6.8 Identify both potential hazards and accident scenarios in the work environment.
- 6.9 Follow established safety procedures (OSHA regulations and utility company procedures).
- 6.10 Evaluate changes in the environment with respect to their impact on safety of self and others.
- 6.11 Comply with energy industry safety procedures and proper ways to perform work.
- 6.12 Use safety equipment as specified by user manuals and safety training.

- 6.13 Use personal protective equipment (PPE), including safety glasses, hearing protection, gloves, work boots, and hard hats.
- 6.14 Keep personal safety equipment in good working order.
- 6.15 Use tools and equipment in compliance with user manuals and training.
- 6.16 Recognize potential and actual hazardous conditions as they arise.

7.0 Responsibility and Flexibility

Initiate and participate in a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Energy, Environment, and Utilities sector workplace environment and community settings. (Direct alignment with SLS 9-10, 11-12.1)

- 7.1 Recognize how financial management impacts the economy, workforce, and community.
- 7.2 Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles.
- 7.3 Understand the need to adapt to changing and varied roles and responsibilities.
- 7.4 Practice time management and efficiency to fulfill responsibilities.
- 7.5 Apply high-quality techniques to product or presentation design and development.
- 7.6 Demonstrate knowledge and practice of responsible financial management.
- 7.7 Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession.
- 7.8 Explore issues of global significance and document the impact on the Energy, Environment, and Utilities sector.

8.0 Ethics and Legal Responsibilities

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms. (Direct alignment with SLS 11-12.1d)

- 8.1 Access, analyze, and implement quality assurance standards of practice.
- 8.2 Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Energy, Environment, and Utilities industry sector.
- 8.3 Demonstrate ethical and legal practices consistent with Energy, Environment, and Utilities sector workplace standards.
- 8.4 Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace.
- 8.5 Analyze organizational culture and practices within the workplace environment.
- 8.6 Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information.
- 8.7 Conform to rules and regulations regarding sharing of confidential information, as determined by Energy, Environment, and Utilities sector laws and practices.

9.0 Leadership and Teamwork

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization. (Direct alignment with SLS 11-12.1b)

- 9.1 Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.

- 9.2 Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities.
- 9.3 Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting.
- 9.4 Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities.
- 9.5 Understand that the modern world is an international community and requires an expanded global view.
- 9.6 Respect individual and cultural differences and recognize the importance of diversity in the workplace.
- 9.7 Participate in interactive teamwork to solve real Energy, Environment, and Utilities sector issues and problems.

10.0 Technical Knowledge and Skills

Apply essential technical knowledge and skills common to all pathways in the Energy, Environment, and Utilities sector.

- 10.1 Interpret and explain terminology and practices specific to the Energy, Environment, and Utilities sector.
- 10.2 Comply with the rules, regulations, and expectations of all aspects of the Energy, Environment, and Utilities sector.
- 10.3 Construct projects and products specific to the Energy, Environment, and Utilities sector requirements and expectations.
- 10.4 Coordinate with industry experts for specific technical knowledge and skills.
- 10.5 Maintain and troubleshoot equipment used in the energy, environment, and utilities industry.
- 10.6 Identify and evaluate questions that require skilled investigation to solve current problems cited in literature or media, or observed through personal observations.

11.0 Demonstration and Application

Demonstrate and apply the knowledge and skills contained in the Energy, Environment, and Utilities anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organization

- 11.1 Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Energy, Environment, and Utilities sector program of study.
- 11.2 Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level.
- 11.3 Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures.
- 11.4 Employ entrepreneurial practices and behaviors appropriate to Energy, Environment, and Utilities sector opportunities.
- 11.5 Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators.

A. Environmental Resources Pathway Standards

The Environmental Resources pathway prepares students for employment, postsecondary education, and/or training in a variety of environmental industries.

Sample occupations associated with this pathway:

Air Quality Technician

Climatologist

Environmental

Biologist/Technician/Scientist

Environmental Health and Safety Officer

Hazardous Waste Operations and Emergency Response Technician

- A1.0 Identify energy resources and the effects of these resources on the environment.
- A1.1 Classify energy resources by type: depletable, nondepletable, renewable, and nonrenewable.
- A1.2 Discover new and emerging energy resources.
- A1.3 Compare the advantages and disadvantages of energy resources in terms of the effects on the environment.
- A1.4 List jobs in the community that result from, or are influenced by, processing and using energy resources.
- A2.0 Identify and describe the global interactive systems and elements that create and sustain climate.
- A2.1 Describe the natural elements that interact to create climate.
- A2.2 Identify world climate patterns and summarize factors that affect climate.
- A2.3 Analyze the impact of climate upon human activities and needs.
- A2.4 Identify the greenhouse effect and climate change.
- A2.5 Explain how greenhouse gasses are generated.
- A2.6 Assess impacts of greenhouse gasses on the environment.
- A3.0 Evaluate regional interactive systems and elements that create harmful environmental effects.
- A3.1 Describe the sources of, and impacts attributable to, pollution and contamination.
- A3.2 Recognize the actions that cause resource depletion.
- A3.3 Define the causes of erosion and soil depletion.
- A3.4 Describe the attributes and proliferation of hardscape.
- A3.5 Identify the sources of, and impacts attributable to, habitat alteration.
- A4.0 Research the environmental implications of energy conversion processes and energy transmission systems.
- A4.1 Define the basic terms, characteristics, and concepts of physical and chemical processes related to energy conversion.
- A4.2 Identify the basic principles of energy systems, including chemical, hydraulic, pneumatic, electrical, nuclear, solar, wind, and geothermal.
- A4.3 Analyze the impacts of energy conversion processes as they relate to activities across the environment.
- A5.0 Identify the role and impact of waste management systems and their operations on the environment.
- A5.1 Understand the role of waste and storm water management systems, their operation, and their impact on the environment.
- A5.2 Explore the causes and effects of pollution linked to wastewater treatment facilities.

- A5.3 Identify wastewater treatment processes that lessen environmental impacts and improve water reuse.
- A5.4 Explain the types and sources of hazardous waste, and associated safety practices and legal requirements for handling and disposing of such waste.
- A5.5 Design solid waste disposal processes that lessen environmental impacts and improve recycling.
- A6.0 Understand the field of land use management and its potential for environmental impact.
- A6.1 Describe the need for, and role of, habitat preservation.
- A6.2 Describe the composition, role, and function of ecosystems, including trends affecting viability.
- A6.3 Demonstrate the need for, and methods of, land use planning.
- A6.4 Identify the aspects of land use planning and describe current trends.
- A6.5 Summarize the relationship between land use planning and energy use and distribution.
- A6.6 Explain the laws and regulations pertaining to land use planning.
- A6.7 Develop strategies to maximize the effectiveness of land use planning.
- A7.0 Research the role of air quality management and systems, their operations, and their impact on the environment.
- A7.1 Understand the elements that create outdoor air quality.
- A7.2 Summarize the causes of air pollutants and their chemical composition.
- A7.3 Research air pollutants and their threat to human health.
- A7.4 Understand U.S. and California laws and regulations related to air pollution control programs and health effects of air pollution.
- A7.5 Describe the basic U.S. Environmental Protection Agency (EPA) and California Air Resources Board (ARB) roles and regulations.
- A8.0 Implement processes to support energy efficiency.
- A8.1 Understand the relationship between power and energy efficiency.
- A8.2 Outline how domestic and industrial appliances and systems affect the environment, such as water units and heating and cooling systems.
- A8.3 Compare costs of alternate/renewable energy sources, systems, and appliances and traditional energy sources, systems, and appliances.
- A8.4 Conduct an energy audit.
- A9.0 Research drinking-water sources, systems, treatment, and conservation.
- A9.1 Understand water reuse: issues, strategies, technologies, and applications.
- A9.2 Analyze strategies for improving energy efficiencies in water collection and distribution.
- A9.3 Describe the role of environmental engineering and green energy in water systems.
- A9.4 Understand the functions and operations of water storage, reservoirs, aqueducts, and dams.
- A10.0 Evaluate the impact and flow management of storm water, rivers, and groundwater.
- A10.1 Understand the designs and tools used in water flow management.
- A10.2 Describe watershed modeling.
- A10.3 Understand the principles and applications of drainage engineering.
- A10.4 Use the Hydrologic Engineering Centers River Analysis System (HEC-RAS).
- A10.5 Analyze and interpret contaminated harbor and river sediment.
- A10.6 Describe the concerns and strategies for catastrophic storm water events and management.
- A11.0 Prepare an efficient solar heated water design and installation plan.
- A11.1 Identify the characteristics of solar heated water design and installation.
- A11.2 Describe the requirements of solar water heaters that meet regulations.
- A11.3 Describe solar hot water financial support programs and regulations.

- A11.4 Analyze efficient solar water heating systems.
- A12.0 Identify and analyze issues, legislation, and regulations related to energy and the environment.
- A12.1 Identify and discuss major environmental laws and policies, including the regulatory and legislative processes used to create such laws.
- A12.2 Understand current regulations concerning recycling, solid waste, land use management, water quality, and renewable and nonrenewable energy.
- A12.3 Compare and contrast environmental laws and regulations that may have a positive or negative impact on the environment and the economy.
- A12.4 Create an environmental law or regulation and explain how it will impact the environment.

Instructional Methods and/or Strategies

Instructional methods include labs, worksheets, group activities, videos, internet research, case studies, lecture, field trips, homework, quizzes and tests. Interdisciplinary instructional methods are implemented allowing students to learn the real-world applications of environmental resources topics.

Assessment Methods and/or Tools

- Tests
- Quizzes
- Lab Reports
- Written homework assignments
- Field Trip Data Collection and Interpretation
- Group assignments

Summative Assessments

Career Presentations using at least one of the following options:

- Oral Presentation
- Digital (Google) Slide Show
- Poster
- Essay
- Video

Assessment Criteria

A+ = 100% - 97%

A = 96% - 93%

A- = 92% - 90%

B+ = 89% - 87%

B = 86% - 83%

B- = 82% - 80%

C+ = 79% - 77%

C = 76% - 73%

C- = 72% - 70%

D+ = 69% - 67%

D = 66% - 63%

D- = 62% - 60%

F = 59% - 0%