

VALLEY ROP COURSE OUTLINE

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| COURSE TITLE: | Environmental Science | |
| VALLEY ROP #: | AG-4010-ES | |
| CDE #: | 1505 | |
| CBEDS TITLE: | Plant & Soil Science | |
| CBEDS #: | 4010 | |
| CTE SECTOR: | Agriculture & Natural Resources | |
| CTE PATHWAY: | Plant & Soil Science | |
| JOBS TITLES: | Environmental Scientist/Analyst | 17-2081.00 |
| | Environmental Engineering Technician | 19-4091.00 |

COURSE DESCRIPTION:

This course emphasizes the use of the ecosystem concept to the study of environmental problems. This will be accomplished by learning basic information regarding interrelations of the ecosystem and applying this information in problem solving. The importance of conservation and preservation will be discussed within the constraints dictated by human development and human needs. The course requires completion of many research and field projects.

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| DATE APPROVED: | August 2001 |
| REVISED DATE(S): | February 25, 2005 / April 20, 2005 / January 30, 2006 / December 2008 / March 2009/Nov 2009 |

HOURS: 180 per year

CREDITS: 10 per year

PREREQUISITES: None

GRADE LEVEL: 11-12

ARTICULATION(S): This course if UC "g" approved.

TEXTBOOKS

Glencoe Science: Earth Science, 2002, by Zike Thompson, Glencoe/McGraw Hill, McLaughlin
Managing Our Natural Resources, 4th Edition, 2002, by William G. Camp and Thomas B. Daughtery, Thompson Learning, Inc.
The Natural Audobon Society Guide to California, 1998, by Peter Alden and Fred Heath, Alfred A. Knopf, Inc.
Environmental Science: A Study of Interrelationships, 1995, by William C. Brown, Eldon D Enger

COURSE COMPETENCIES:

Upon completion of this course, the student will:

- Use agricultural applications as a vehicle to teach environmental principles and improve the scientific literacy of students.
- Increase comprehension of environmental issues and current research results and methods as they relate to the Central Valley, to our Global Economy, and to the students themselves.
- Understand environmental principles and apply them to social, economic, and ethical issues.
- Apply decision-making skills environmentally based to student lives and future.
- Investigate multiple career opportunities in environmentally related fields.
- Apply Language Arts and Math skills to environmental studies.
- Develop critical thinking and problem solving skills through direct experience in the lab and in the field.
- Develop ability to transfer science knowledge, skills, and models to new situations and applications.

INSTRUCTIONAL METHODS:

- Direct Instruction
- Project work in small groups and individual
- Research
- Lab Activities
- Videos

EVALUATION METHODS:

Assessment opportunities, which allow continuous evaluation of students' progress, will be embedded throughout the course and should be a learning experience. All students will be expected to achieve mastery of all topics; often, demonstrations of mastery will occur in a public forum. The following strategies, which include both formal and informal assessment techniques will include, but are not limited to:

- Written Tests and Quizzes
- Written Unit Research Papers
- Unit Projects
- Class participation

COURSE OUTLINE:

| Unit of Instruction | Estimated Hours | Standards |
|--|--|----------------------|
| Environmental Science Fundamentals | 15 | |
| <ul style="list-style-type: none">Natural ResourcesForms of EnergyEnvironmental IssuesAnalyzing the EnvironmentEnergy through an EcosystemEnvironmental QualityRenewal and Nonrenewable ResourcesAlternative Forms of EnergyAnalyzing Impact of Agriculture Practices on the EnvironmentStudent Outcomes: Students will research and address the following in written format:<ul style="list-style-type: none">Distinguish between renewable and nonrenewable natural resource.Describe the challenges faced in conserving natural resources.Analyze environmental issues from political and scientific perspectives.Assess public sensitivity to environmental issues.Describe the government's role in environmental policy decisions.Describe how humans are a part of biotic communities.Describe how homeostasis occurs within an ecosystem.Analyze the internal consequences of human alterations to an ecosystem.Describe how the human population has affected and is affecting the environment.Define the concept of sustainable development.Assess the significance of agricultural production to human needs and the needs of society.Analyze how sustainability relates to the concept of sustainable agriculture.Analyze the impact of agricultural production practices on the environment. | E2 E12, E13 E2 E1 E12 E1 E1 E2,E3,E4,E6 | |
| Matter Cycling | 25 | E1 |
| <ul style="list-style-type: none">CarbonNitrogenPhosphorusStudent Outcomes: Students will research and address the following in written format.<ul style="list-style-type: none">Compare and contrast carbon, nitrogen, phosphorus cycles.Analyze these cycles' impact on the environment. | | |
| Identification and Management of Ecosystem | 25 | E2, E2, E3, E10, E12 |
| <ul style="list-style-type: none">Basic Ecological ConceptsManagement of U.S. EcosystemsGrassland EcosystemsForest EcosystemsAquatic EcosystemsWetland EcosystemsStudent Outcomes: Students will research and address the following in written format.<ul style="list-style-type: none">Describe how energy is transferred from one organism to another using the concepts of producer, consumer, decomposer, food web, food chain, and biotic pyramid.Describe how environmental (abiotic) factors influence the location of ecosystems.Describe how ecosystems are impacted by human activity. | | |

- Explain how sustainable and multiple-use management approaches can help maintain ecological balance in ecosystems.
- Give examples of plant and animal associations and their adaptations to grassland habitat.
- Give examples of how human activities have had an impact on grassland ecosystems.
- Describe how the concepts of sustainability and multiple-use can help maintain grassland ecosystems.
- Explain how ecological succession occurs in forest ecosystems.
- Interpret the value of forest ecosystems for humans and the impact people have on them.
- Describe how the concepts of sustainability and multiple-use can help maintain forest ecosystems.
- Describe aquatic ecosystem types (standing, freshwater, flowing freshwater, and oceans).
- Describe examples of human influence on aquatic ecosystems and the impact.
- Explain the watershed protection approach to managing aquatic ecosystems.
- Distinguish wetlands from other ecosystems.
- Describe the impact humans have on wetland ecosystems.
- Explain how the concept of sustainability can help maintain wetland ecosystems.
- Project: Students are to over time study an Aquatic Ecosystem and analyze changes. Analysis will be conducted according to established criteria.

Soil Conservation

15

E3

- Physical Properties of Soil
- Analysis of Soil Erosion and Human's Affect on Soil Erosion
- Evaluating Methods of Soil Erosion Control
- Student Outcomes: Students will research and address the following in written format.
 - Specify the importance of soil to the lives of humans.
 - Describe soil characteristics and how they affect the uses of land.
 - Differentiate between geological erosion and man-made soil erosion.
 - Specify ways soil erosion could be prevented or reduced.
 - Interpret the effect waste disposal has on soil properties and characteristics.
 - Speculate on ways soil degradation could be limited.
 - Differentiate between mechanical and vegetative soil erosion control.
 - Analyze methods of controlling farm and non-farm soil erosion.
 - Project: Given a case scenario the students will select the best soil conservation. Practice to be used and support why.

Management of Waste

20

- Preventing, Reducing, and Disposing of Solid Waste
- Manure Management Practices
- Student Outcomes: Students will research and address the following in written format:
 - Identify the criteria used for classifying materials as "hazardous", and discuss the health and safety risks of improper hazardous waste disposal.
 - Describe how the United States compares to other countries in the total amount of waste generated.
 - Explain how solid waste materials can be reduced and/or reused.
 - Explain how a community can benefit from an integrated waste disposal system.
 - Describe environmentally-sound manure storage and treatment systems.
 - Project: Students are to conduct a survey on Consumer Awareness on products made from recycled materials. They will create the survey and gather data. They will analyze and draw a conclusion as to how effective we are as a nation in educating people on recycling.

Land Uses

15

E3, E4, E5, E7, E10

- Land-Use Planning
- How Soil Affects Land Use
- Evaluating Land Use Issues
- Student Outcomes: Students will research and address the following in written format:
 - Compare past and present uses of land including alternative uses of land.
 - Explain land-use planning and reasons for planning land use.
 - Analyze solid properties that affect how land is used.
 - Understand the relationship between land use and population growth.
 - Explain rights and responsibilities of landowners.
 - Describe how land use laws are passed.
 - Project: Students will analyze a case study with the objective of selecting the most appropriate use for an area of land. Case study will include conducting a Percolation test, random sampling survey, and decision-making criteria.

Chemicals and the Environment

10

- Defining and Valuing Chemicals
- Regulating and Controlling Chemical Use
- Safe Handling and Applications of Chemicals
- Student Outcomes: Students will research and address the following in written format:
 - Assess the economic benefit of chemical usage.
 - Evaluate the convenience and accessibility of chemicals.
 - Determine the implications if chemicals were not used in society.
 - Determine the differences between natural and synthetic chemicals.
 - Determine how to dispose of excess chemicals and chemical containers.
 - Assess the developmental and regulatory process of chemicals.
 - Analyze benefit vs. potential adverse effects of chemicals.
 - Project: Students will conduct Herbicide Trials experimentations to answer the question: What is our dependency on chemicals?

Water Quality

15

E2

- Understanding Water Quality
- Determining Measures to Ensure Water Quality
- Analyzing Issues and Laws Re: Water Quality
- Student Outcomes: Student will research and address the following in written format:
 - Describe factors which make water quality important to today's society.
 - Describe how water is processed in the hydrologic cycle.
 - Assess the cumulative effect of pollution on water quality.
 - Analyze industrial activities that are designed to improve and maintain water quality.
 - Analyze the impact that wetlands have on water quality.
 - Describe the impact of water conservation on water quality.
 - Project: Students will analyze water quality using the Vernier computer water quality system to 12 different tests at 4 different sites on the Kings River.

Air Quality

15

E2

- Air Pollutants and Their Effects
- Quality of Life and Air Pollution
- Acid Rain
- Clean Air Act and Environmental Law
- Student Outcomes: Students will research and address the following in written format:
 - Describe the effects of major air pollutants on the health of people, plants, and animals.

- Describe how the major air pollutants are regulated and controlled.
- Explain how damage created by major air pollutants has an effect on the economy.
- Describe the “benefit-cost analysis” used in economics to compare the benefits to control air pollution vs. the cost.
- Describe the processes of air pollution control technologies.
- Describe the affects of air pollution on the U.S. and other countries.
- Explain how the Clean Air Act has impacted air quality.
- Describe air pollution allowances.
 - Project: Students will conduct air quality experiments using Baking Soda as a Ph Buffer/Neutralizer and as a Deodorizer.

Global Change 15 E13

Environmental Quality
Public Policy
The Future

- Student Outcomes: Students will research and develop a paper problem-solving the solution for environmental quality for the world.

Career Exploration 10 E2 thru E13

- Investigate multiple career opportunities in environmentally related fields.
- Develop portfolio of projects.
- Project: Students will explore the requirements, expectations, and demand outlook for occupations associated with maintaining environmental quality. Using primary (interviews) and secondary research students will answer the following questions and submit their presentation in written format:
 - What is the occupation of interest? Explain type of work, demand, and conditions.
 - What are the reasons for selecting this particular occupation?
 - What are the educational requirements, special training, and work experience required for this occupation?
 - What are the earnings or salary that can be expected from this occupation?
 - What personal skills, interests, and aptitudes are needed to be successful in this occupation?
 - What are the advantages and disadvantages associated with this occupation?
 - What are the possible non-financial rewards and satisfactions associated this occupation?
 - What are the possible occupational advancements or opportunities?

Career Preparation Standards 10

Total Hours **180 Total Hours**

CAREER PREPARATION STANDARDS:

- A. PERSONAL SKILLS** - Students will understand how personal skill development affects their employability. This skill includes positive attitudes, self-confidence, honesty, responsibility, initiative, self-discipline, personal hygiene, time management, and the capacity for lifelong learning.
1. Demonstrate an understanding of classroom policies and procedures.
 2. Discuss importance of the following personal skills in the business environment:
 - a. positive attitude
 - b. self-confidence
 - c. honesty
 - d. perseverance
 - e. self-management/work ethic
 - f. pride in product/work
 - g. dependability
 3. Identify acceptable work attire.
 4. Establish goals for self-improvement and further education/training.
 5. Prioritize tasks and meet deadlines.
 6. Understand the importance of initiative and leadership.
 7. Understand the importance of lifelong learning in a world of constantly changing technology.
- B. INTERPERSONAL SKILLS** - Students will understand key concepts on group dynamics, conflict resolution, and negotiation. This skill includes the ability to work cooperatively, accept supervision, assume leadership roles, and show respect for others. This standard includes an understanding of sexual harassment laws and an appreciation of cultural diversity in the workplace.
1. Identify and discuss behaviors of an effective team.
 2. Explain the central importance of mutual respect in the workplace relations.
 3. Discuss and demonstrate strategies for conflict resolution and negotiation, and explain their importance within the business environment.
 4. Understand laws that apply to sexual harassment in the workplace, and identify tactics for handling harassment situations.
 5. Work cooperatively, share responsibilities, accept supervision and assume leadership roles.
 6. Demonstrate cooperative working relationships and proper etiquette across gender and cultural groups.
- C. THINKING AND PROBLEM-SOLVING SKILLS** - Students will exhibit critical and creative thinking skills, logical reasoning, and problem-solving. These skills include applying basic skills in order to calculate, estimate, measure; identify, locate, and organize information/data; interpret and follow directions from manuals, labels, and other sources; analyze and evaluate information and solutions.
1. Recognize the importance of good academic skills and implement a plan for self-improvement as needed.
 2. Read, write, and give directions.
 3. Exhibit critical and creative thinking skills and logical reasoning skills, and employ these skills for problem solving.
 - a. Work as a team member in solving problems.
 - b. Diagnose the problem, its urgency, and its causes.
 - c. Identify alternatives and their consequences.
 - d. Explore possible solutions.
 - e. Compare/contrast the advantages and disadvantages of alternatives.
 - f. Determine appropriate action(s).
 - g. Implement action(s).
 - h. Evaluate results of action(s) taken.

- D. **COMMUNICATION SKILLS** - Students will understand principles of effective communication. This standard includes effective oral and written communication, listening skills, following and giving directions, requesting and giving information, asking questions.
1. Use communication concepts in application of skills, techniques, and operations.
 - a) Prepare written material.
 - b) Analyze written material.
 2. Understand and implement written instructions, from technical manuals, written communications, and reference books.
 3. Present a positive image through verbal and nonverbal communication, and understand the power of body language in communication.
 4. Demonstrate active listening through oral and written feedback.
 5. Give and receive feedback.
 6. Demonstrate assertive communications (both oral and written).
 7. Demonstrate proper etiquette in workplace communications, including an awareness of requisites for international communications (languages, customs, time zones, currency and exchange rates).
 8. Demonstrate writing/editing skills as follows:
 - a) Write, proofread, and edit work.
 - b) Use correct grammar, punctuation, capitalization, vocabulary, and spelling.
 - c) Select and use appropriate forms of technology for communication.
 9. Exhibit a proficiency in the use of reference books.
 10. Research, compose, and orally present information for a variety of business situations utilizing appropriate technology.
- E. **OCCUPATIONAL SAFETY** - Students will understand occupational safety issues, including the avoidance of physical hazards in the work environment. This includes the safe operation of equipment, proper handling of hazardous materials, appropriate attire and safety accessories, avoidance of physical injuries, interpretation of warning and hazard signs and terminology, and following and understanding safety-related directions.
1. Discuss and implement good safety practices, including the following (if applicable to course):
 - a. personal
 - b. lab
 - c. fire
 - d. electrical
 - e. equipment
 - f. tools
 - g. interpretation of Material Safety Data Sheets (MSDSs)
 - h. Environmental Protection Agency (EPA)
 - i. Occupational Safety and Health Administration (OSHA)
 - j. American Red Cross Standards (ARC)
 - k. Networking Safety Standards
 2. Apply sound ergonomic principles in organizing one's work space.
- F. **EMPLOYMENT LITERACY** - Students will understand career paths and strategies for obtaining employment within their chosen field. This includes traditional job preparation skills, such as resumes, application forms, cover letters, sources of employment information, and interviewing skills, but also includes an overview of the industry and an understanding of labor market trends.
1. Explore career opportunities and projected trends; investigate required education, training and experience; and develop an individual education plan.
 2. Identify steps for setting goals and writing personal goals and objectives.
 3. Examine aptitudes related to career options; relate personal characteristics and interests to educational and occupational opportunities.
 4. Develop a career portfolio, including the following documents:

- a. job application
 - b. resume(s)
 - c. appropriate cover and follow-up correspondence
5. Identify and demonstrate effective interviewing techniques.
- G. **TECHNOLOGY LITERACY** - Students will understand and adapt to changing technology by identifying, learning, and applying new skills to improve job performance. Students should understand the role of technology in their chosen field and should be able to use all appropriate technology. Students should also feel confident in their ability to learn new technology by generalizing from what they know, adapting skills to new situations, and identifying and using sources of information and of further learning.
1. Demonstrate the ability to use personal computers for loading and retrieving data, information gathering, measurements, and writing.
 2. Identify the characteristics and explain the importance of adapting to changes, being flexible, and evaluating goals when working in the industry.
 3. Understand the importance of lifelong learning in adapting to changing technology.
- H. **IMPORTANCE OF ETHICS** – Students will understand proper ethics in the workplace.
1. Discuss social and ethical responsibilities in the industry.
 2. Demonstrate ethical choices in workplace situations.