

VALLEY ROP COURSE OUTLINE

COURSE TITLE: Environmental Horticulture Science

VALLEY ROP#: AG-4050-EHortSci

CDE #: 463

CBEDS: Ornamental Horticulture

CBEDS #: 4050

CTE SECTOR: Agriculture & Natural Resources

CTE PATHWAY: Ornamental Horticulture

JOB TITLES:

Graders & Sorters, Agricultural Products	45-2041.00	Nursery Workers	45-2092.11
Agricultural Equipment Operators	45-2091.00	Agricultural Inspectors	45-2011.00
Farm Workers & Laborers, Crop	45-2092.02		
Agricultural Workers, all others	45-2099.99		

COURSE DESCRIPTION:

This course will provide the student with theories and principles related to environmental horticulture science. This course is intended to successfully prepare those students who plan on majoring in agricultural sciences at a four-year college and/or university. Specific student outcomes are:

- Utilize Environmental Horticulture Science principles as a relevant vehicle to teach biological principles and improve the science principles and scientific literacy of students.
- Integrate mathematic standards, Language Arts, and science principles into an academically rigorous course that increases the student's capacity to think analytically, problem solve, and utilize effective research practices.

DATE APPROVED: 2003

REVISED DATE(S): March 2009/Oct. 2009

HOURS: 180 hours/year;

CREDITS: 10 credits/year

PREREQUISITES: Algebra I

GRADE LEVEL: 11-12

ARTICULATION(S): Meets the UC "g" Admission Requirement

TEXTSBOOKS: Stern, K (1998). Plant Biology – 5th Edition, Wm. C. Brown Publishing, NY, NY. Arms, K (1996). Environmental Science, Harcourt Brace & Company, Orlando, Florida. Schroeder, C., Seagle, E. & Felton, L. (2003). Horticulture – 4th Edition, Prentice Hall Interstate, Upper Saddle River, New Jersey. University of California, Davis & California Department of Education (1991). Agriculture Model Curriculum Lesson Plans for Ornamental Horticulture. CDE Press. Sacramento, CA.

RESOURCES:

- CDE Biological Science Content Standards
- Research Handouts
- Videos

- DVD's
- Internet

COURSE COMPETENCIES:

Upon completion of this course, the student will:

- To develop an appreciation of horticulture.
- To incorporate scientific methods and biological principles with modern agricultural practices.
- To create an awareness of the importance of horticulture.
- To prepare students for college level entry in the various disciplines of horticulture.
- To understand the importance of plants, their uses, and incorporation of plants in our society.
- To be familiar with cell theory and its application to the organization of all organisms.
- To recognize plant physiology, growth requirements, and nutrients needed for optimum plant growth.
- To recognize the diversity of life and the interrelationships among all organisms
- To understand the role of plants in our landscape, the process of design, installation, and maintenance of those plant materials.
- To be aware of the historical and descriptive nature of horticulture as a science.
- To acquire agricultural and biological vocabulary, and the reading, writing and critical thinking skills pertaining to the science.

INSTRUCTIONAL METHODS:

- Lecture
- Audio Visual Materials
- Research Readings and Written Presentations
- Homework Assignments
- Group & Individual Activities
- Laboratory Investigation – 1 per week (20% of grade)
- Discussion & Group Dynamics
- Quizzes, Tests & Final Exam
- Guest Speakers
- Field Trips
- Internet Exploration
- Seminar Presentation

KEY ASSIGNMENTS:

- Research Paper on Environmental Horticulture
- Seminar Presentation on Horticulture Science Practices
- Development of Science Fair Project relating to Environmental Horticulture
- Laboratory activities
- Supervised Agricultural Experience Project & Record Book
- FFA Leadership Participation

LABORATORY ACTIVITIES:

- The Scientific Method
- Analyzing Ecosystems
- Checking water for Coliform Bacteria
- Genotypic and phenotypic ratios
- Cell identification
- Flower dissection and pollen growth germination

- Secondary and microelements with N-P-K tissue tests on plants
- Water germination test
- Cold germination test
- Determining salt tolerance
- Factors affecting photosynthesis
- Effects of leaf surface area, air movement, and light on transpiration rates
- Effects of light quality on plant growth
- Geotropism
- Phototropism
- The Hydrologic Cycle
- Comparison of soil vs. non-soil plant culture
- Effects of nutrient concentrations on hydroponics plant growth
- Effects of chemicals (herbicides) on plants
- Herbicide biopsy
- Effects of rooting hormone on root development
- Effects of gibberellic acid on seed germination
- Another culture
- DNA extraction
- Probability of trait inheritance
- Tissue culture
- Seed dispersal
- Genetic probability
- Insect identification
- Environmental forcing structures
- Comparison of asexual propagation methods
- Water quality
- Plant pigment chromatography

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:

- Quizzes, Tests & Final Exam
- Laboratory Investigation & Write-ups
- Writing Assignments
- Leadership & Critical Thinking Activities
- Research report and seminar presentation
- Supervised Agricultural Experience Project & Record Book

COURSE OUTLINE:

Unit of Instruction	Estimated Hours	State Framework
Agricultural Effects of Environmental Ecology	12	
<ul style="list-style-type: none">• Categories and sources of pollution• Conserving natural and water resources• Agricultural practices beneficial and harmful to the environment• Chemical erosion & physical properties• Ecosystems• The Nitrogen Cycle• The Carbon Cycle• Water Cycle		
Plant Reproduction	25	
<ul style="list-style-type: none">• Asexual reproduction• Sexual reproduction		
Nature of Life	5	
<ul style="list-style-type: none">• Attributes of living organisms• Chemical and physical bases of plant life• Chemical components of protoplasm		
Plant Physiology and Growth	25	
<ul style="list-style-type: none">• Function of plant cells• Examination of cell wall and function• Cellular reproduction• DNA, RNA, and synthesis of proteins• Introduction of root, stem, and leaf structures and functions• Plant growth requirements• Environmental factors on growth• Specialized roots, stems, and leaves• Requirements for seed germination• Plant hormones• Phytochrome• Photoperiodism• Environmental modifications for growth• Managing plant growth		
Plant Pathology and Entomology	7	
<ul style="list-style-type: none">• Common diseases• Effect on development and growth• Method of controls• Orders of Insects		

- Insect structure and development
- IPM practices

Biotechnology Applications in Environmental Horticulture 7

- Biotechnology
- Molecular biotechnology: genetic importance
- Genetic engineering
- Tissue culture

Soil Structure and Function 6

- Components, function, economic uses, and relationship to the earth
- Geologic Cycle
- Chemical and physical weathering
- Soil formation
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Plant Nutriment 10

- Primary, secondary, and micro-nutrients
- Function of nutrients in plant growth
- Nutrient deficiencies & symptoms
- PH requirements and effects on plant life
- Nitrogen fixation and absorption
- Modifying growth

Plant Names and Classifications 7

- Development of the binomial system of nomenclature
- Development of kingdom concept
- Classification of major groups of plants
- Synoptic key to major groups of plants

Introduction to Seed Plants: Gymnosperms 6

- Human and ecological relevance of gymnosperms
- Examination of four major divisions of gymnosperms
- History of gymnosperms

Flowering Plants 10

- Structure and reproduction of flowering plants
- Trends of specialization and classification in flowering plants
- Division Anthophyta
- Plant preservation

Fruits and Seeds 12

- Kinds of fruits
- Fruit and seed dispersal
- Seed structure
- Longevity of seeds & fruits

Plants and Civilizations 14

- Origin of cultivated plants
- Selected families of flowering plants
- Agricultural and urban environment influence

- Multiculturalism and plants
- Ethno-botany
- Pioneers of plants & civilizations

Plant Research Project 14

- Development of environmental horticulture science projects
- Statistical management of project via Record Book
- Instructional coordination and supervision
- Analysis of project results

Professional Opportunities in Environmental Horticulture Science 5

- Biotechnology & research fields
- Other related horticulture science fields

Agricultural Inter-Personal & Leadership Development 15

- Completion of a Supervised Agricultural Experience Program and data collection
- Development of listening, speaking, writing & reading skill activities
- Critical thinking & group team building activities
- Agriculture presentations

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.