

Environmental Horticulture

COURSE OUTLINE

1. **Course Title:** Environmental Horticulture A-G
2. **CBEDS Title:** Horticulture and the Environment
3. **CBEDS Number:** 4050
4. **Job Titles:**

Greenhouse Management	Greenhouse Worker, Foreman Maintenance, Propagator, Tissue Culture
Nursery & Turf Operator	Nursery Worker, Salesman, Plant Propagator, Gardener, Golf Course Maintenance
Landscape	Grounds Worker, Gardening Business, Garden Store Sales

5. Course Description:

This competency-based course is designed to 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:

1. Utilize Environmental Horticulture Science principles as a relevant vehicle to teach biological principles and improve the science principles and scientific literacy of students.
2. 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.

Student Outcomes and Objectives:

Students will:

1. Develop an appreciation of horticulture.
2. Incorporate scientific methods and biological principles with modern agricultural practices.
3. Create an awareness of the importance of horticulture.
4. Prepare students for college level entry in the various disciplines of horticulture.
5. Describe the importance of plants, their uses, and incorporation of plants in our society.
6. Familiar with cell theory and its application to the organization of all organisms.
7. Recognize plant physiology, growth requirements, and nutrients needed for optimum plant growth.
8. Recognize the diversity of life and the interrelationships among all organisms
9. Describe the role of plants in our landscape, the process of design, installation, and maintenance of those plant materials.
10. Awareness of the historical and descriptive nature of horticulture as a science.
11. Acquire agricultural and biological vocabulary, and the reading, writing and critical thinking skills pertaining to the science.

Integrated throughout the course are career preparation standards, which include basic academic skills, communication, interpersonal skills, problem solving, workplace safety, technology, and employment literacy.

Pathway

Recommended Sequence	Courses
Introductory	Agriculture Science Basic Core
Skill Building	Floriculture or Ornamental Horticulture or Environmental Horticulture Science (A-G)
Advanced Skill	Supervised Agricultural Experience Project

6. Hours: *Students receive up to 180 hours of classroom instruction.*

7. Prerequisites: Agriculture Science Core & Biology or Algebra I.

8. Date (of creation/revision): **July 2011**

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Upon successful completion of this course, students will be able to demonstrate the following skills necessary for entry-level employment.				
Instructional Units and Competencies	Course Hours	Model Curr. Standards	CA Academic Content Standards	CAHSEE
<p>I. CAREER PREPARATION</p> <p>A. Career Planning and Management.</p> <ol style="list-style-type: none"> 1. Know the personal qualifications, interests, aptitudes, knowledge, and skills necessary to succeed in careers. <ol style="list-style-type: none"> a. Students will identify skills needed for job success b. Students will identify the education and experience required for moving along a career ladder. 2. Understand the scope of career opportunities and know the requirements for education, training, and licensure. <ol style="list-style-type: none"> a. Students will describe how to find a job. b. Students will select two jobs in the field and map out a timeline for completing education and/or licensing requirements. 3. Know the main strategies for self-promotion in the hiring process, such as completing job applications, resume writing, interviewing skills, and preparing a portfolio. <ol style="list-style-type: none"> a. Students will write and use word processing software to create a resume, cover letters, thank you letters, and job applications. b. Students will participate in mock job interviews. 4. <i>Develop a career plan that is designed to reflect career interests, pathways, and postsecondary options.</i> <ol style="list-style-type: none"> a. <i>Students will conduct a self—assessment and explain how professional qualifications affect career choices.</i> 5. <i>Understand the role and function of professional organizations, industry associations, and organized labor in a productive society.</i> <ol style="list-style-type: none"> a. <i>Contact two professional organization and identify the steps to become a member.</i> 6. <i>Understand the past, present and future trends that affect careers, such as technological developments and societal trends, and the resulting need for lifelong learning.</i> <ol style="list-style-type: none"> a. <i>Students will describe careers in the agriculture industry sector.</i> b. <i>Students will identify work-related cultural differences to prepare for a global workplace.</i> <p>B. Technology.</p> <ol style="list-style-type: none"> 1. Understand past, present and future technological advances as they relate to a chosen pathway and on selected segments of the economy. 2. Understand the use of technological resources to gain access to, manipulate, and produce information, products and services. 3. Use appropriate technology in the chosen career pathway. <p>C. Problem solving and Critical Thinking.</p> <ol style="list-style-type: none"> 1. Understand the systematic problem-solving models that incorporate input, process, outcome and feedback components, and apply appropriate problem-solving strategies and critical thinking to work-related issues and tasks. 	<p>10</p> <p>Additional hours are integrated throughout the course.</p>	<p>Transportation Industry Sector, Model Curriculum Standards</p> <p>3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0</p>	<p><u>Language Arts</u> (8) R 1.3, 2.6 W1.3, 2.5. LC 1.4,1.5 1.6 LS1.2, 1.3, (9/10) R2.1,2.3,2 W2.5 LC1.4 LS 1.1, 2.3 (11/12) R2.3 W2.5 LC1.2 <u>Math</u> (7) NS1.2, 1.7 MR 1.1,1.3 2.7,2.8, 3.1</p>	<p>Lang. Arts R 8.2.1 (9/10) R 2.1, 2.3 W2.5 Math (7) NS 1.2, 1.3, 1.7 MR 1.1, 2.1, 3.1</p>

<p>2. Use and apply critical thinking and decision making skills to make informed decisions, solve problems, and achieve balance in the multiple roles of personal, home, work and community life.</p> <p>D. Health and Safety.</p> <ol style="list-style-type: none"> 1. Know policies, procedures, and regulations regarding health and safety in the workplace, including employers' and employees' responsibilities. 2. Understand critical elements of health and safety practices related to a variety of business environments. <p>E. Responsibility & Flexibility.</p> <ol style="list-style-type: none"> 1. Understand the qualities and behaviors that constitute a positive and professional work demeanor. 2. Understand the importance of accountability and responsibility in fulfilling personal, community, and workplace roles and how individual actions can affect the larger community. 3. Understand the need to adapt to varied roles and responsibilities. <p>F. Ethics and Legal Responsibilities</p> <ol style="list-style-type: none"> 1. Know the major local, district, state, and federal regulatory agencies and entities that affect the industry and how they enforce laws and regulations. 2. Understand the concept and application of ethical and legal behavior consistent with workplace standards. <ol style="list-style-type: none"> a. <i>Contact a business and obtain a copy of their rules for employment.</i> b. <i>Role play difference ethical scenarios.</i> 3. Understand the role of personal integrity and ethical behavior in the workplace. <p>G. Leadership and Teamwork.</p> <ol style="list-style-type: none"> 1. Understand the characteristics and benefits of teamwork, leadership, citizenship in the school, community, and workplace settings for effective performance and attainment of goals. 2. Understand the ways in which professional associations, such as FFA, and competitive career development activities enhance academic skills, career choices, and contribute to promote employability. 3. Know multiple approaches to personal conflict resolution and understand how to interact with others in ways that demonstrate respect for individual and cultural differences and for the attitudes and feelings of others. 				
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Instructional Units and Competencies	Hours	Model Curr. Standards.	CA Academic Standards	CAHSEE
<p>A. Agricultural Effects of Environmental Ecology</p> <ol style="list-style-type: none"> 1. Categories and sources of pollution 2. Conserving natural and water resources 3. Agricultural practices beneficial and harmful to the environment 4. Chemical erosion & physical properties 5. Ecosystems 6. The Nitrogen Cycle 7. The Carbon Cycle 8. Water Cycle 	5	Agriculture & Natural Resources Industry Sector Ornamental Horticulture Pathway F1.0, 1.1,1.3, 1.4 F2.1, 2.2, 2.6 F3.0,3.1,F3.2 F5.0,5.1,5.4 F8.0,8.3	1.2Sci (9-12) (1.a), (1.c) (1.d),(1.f) (1.j),(1.m) 2.0Com (9-12) (2.3),(2.4) 2.2W (11-12) (1.3),(1.6) 2.3WO (11-12) (1.1),(1.2)	(10)WA 1.1 (10)R2. 5, 2.7, 2.8 (10)WS 1.1,1.2, 1.3,1.6 (6)P2.5, P3.5
<p>B. Plant Reproduction</p> <ol style="list-style-type: none"> 1. Asexual reproduction 2. Sexual reproduction 	15	Plant & Soil Science Pathway G2.0,2.6 G3.0,3.4, G5.0,5.1,5.2, 5.4	2.4L&S (9-10) (1.1)	(7)AF1. 5
<p>C. Nature of Life</p> <ol style="list-style-type: none"> 1. Attributes of living organisms 2. Chemical and physical bases of plant life 3. Chemical components of protoplasm 	7	Foundation Standards 9.0, 10.2		
<p>D. Plant Physiology and Growth</p> <ol style="list-style-type: none"> 1. Function of plant cells 2. Examination of cell wall and function 3. Cellular reproduction 4. DNA, RNA, and synthesis of proteins 5. Introduction of root, stem, and leaf structures and functions 6. Plant growth requirements 7. Environmental factors on growth 8. Specialized roots, stems, and leaves 9. Requirements for seed germination 10. Plant hormones 11. Phytochrome 12. Photoperiodism 13. Environmental modifications for growth 14. Managing plant growth 	3			

E.	Plant Pathology and Entomology 1. Common diseases 2. Effect on development and growth 3. Method of controls 4. Orders of Insects 5. Insect structure and development 6. IPM practices	10			
F.	Biotechnology Applications in Environmental Horticulture 1. Biotechnology 2. Molecular biotechnology: genetic importance 3. Genetic engineering 4. Tissue culture	10			
G.	Soil Structure and Function 1. Components, function, economic uses, and relationship to the earth 2. Geologic Cycle 3. Chemical and physical weathering 4. Soil formation	20			
H.	Plant Nutrients 1. Primary, secondary, and micro-nutrients 2. Function of nutrients in plant growth 3. Nutrient deficiencies & symptoms 4. PH requirements and effects on plant life 5. Nitrogen fixation and absorption 6. Modifying growth	15			
I.	Plant Names and Classifications 1. Development of the binomial system of nomenclature 2. Development of kingdom concept 3. Classification of major groups of plants 4. Synoptic key to major groups of plants				
J.	Introduction to Seed Plants: Gymnosperms 1. Human and ecological relevance of gymnosperms 2. Examination of four major divisions of gymnosperms 3. History of gymnosperms				

Instructional Units and Competencies	Hours	Model Curr. Standards.	CA Academic Standards	CAHSEE
K. Flowering Plants 1. Structure and reproduction of flowering plants 2. Trends of specialization and classification in flowering plants 3. Division Anthophyta 4. Plant preservation	10			
L. Fruits and Seeds 1. Kinds of fruits 2. Fruit and seed dispersal 3. Seed structure 4. Longevity of seeds & fruits	5			
M. Plants and Civilizations 1. Origin of cultivated plants 2. Selected families of flowering plants 3. Agricultural and urban environment influence 4. Multiculturalism and plants 5. Ethno-botany 6. Pioneers of plants & civilizations	15			
N. Plant Research Project 1. Development of environmental horticulture science projects 2. Statistical management of project via Record Book 3. Instructional coordination and supervision 4. Analysis of project results	10			
O. Professional Opportunities in Environmental Horticulture Science 1. Biotechnology & research fields 2. Other related horticulture science fields	20			
P. Agricultural Inter-Personal & Leadership Development 1. Completion of a Supervised Agricultural Experience Program and data collection 2. Development of listening, speaking, writing & reading skill activities 3. Critical thinking & group team building activities 4. Agriculture presentations	3			

KEY ASSIGNMENTS:

- A. Research Paper on Environmental Horticulture
- B. Seminar Presentation on Horticulture Science Practices
- C. Development of Science Fair Project relating to Environmental Horticulture
- D. Laboratory activities
- E. Supervised Agricultural Experience Project & Record Book
- F. FFA Leadership Participation

INSTRUCTIONAL METHODS:

- A. Lecture
- B. Audio Visual Materials
- C. Research Readings and Written Presentations
- D. Homework Assignments
- E. Group & Individual Activities
- F. Laboratory Investigation – 1 per week (20% of grade)
- G. Discussion & Group Dynamics
- H. Quizzes, Tests & Final Exam
- I. Guest Speakers
- J. Field Trips
- K. Internet Exploration
- L. Seminar Presentation

ASSESSMENT METHODS:

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| A. | Quizzes, Tests & Final Exam | 40% |
| B. | Laboratory Investigation & Write-ups | 20% |
| C. | Writing Assignments | 10% |
| D. | Leadership & Critical Thinking Activities | 10% |
| E. | Research report and seminar presentation | 10% |
| F. | Supervised Agricultural Experience Project & Record Book | 10% |

LABORATORY ACTIVITIES:

- A. The Scientific Method
- B. Analyzing Ecosystems
- C. Checking water for Coliform Bacteria
- D. Genotypic and phenotypic ratios
- E. Cell identification
- F. Flower dissection and pollen growth germination
- G. Secondary and microelements with N-P-K tissue tests on plants
- H. Water germination test
- I. Cold germination test
- J. Determining salt tolerance
- K. Factors affecting photosynthesis
- L. Effects of leaf surface area, air movement, and light on transpiration rates
- M. Effects of light quality on plant growth

- N. Geotropism
- O. Phototropism
- P. The Hydrologic Cycle
- Q. Comparison of soil vs. non-soil plant culture
- R. Effects of nutrient concentrations on hydroponics plant growth
- S. Effects of chemicals (herbicides) on plants
- T. Herbicide biopsy
- U. Effects of rooting hormone on root development
- V. Effects of gibbarellic acid on seed germination
- W. Anther culture
- X. DNA extraction
- Y. Probability of trait inheritance
- Z. Tissue culture
- AA. Seed dispersal
- BB. Genetic probability
- CC. Insect identification
- DD. Environmental forcing structures
- EE. Comparison of asexual propagation methods
- FF. Water quality
- GG. Plant pigment chromatography

TEXTS & SUPPLEMENTAL INSTRUCTIONAL RESOURCES:

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.

College Credit: Science elective credit - G

Items listed below are commonly used as supplementary materials and are coordinated with the adopted course objectives:

- CDE Biological Science Content Standards
- Research Handouts
- Videos
- DVD's
- Internet