

Murrieta Valley Unified School District
High School Course Outline
June 2013

Department: Science

Course Title: Environmental Horticulture

Course Number: 3030

Grade Level(s): 10-12

Length of Course: 1 year

Prerequisite(s): Successful completion of CP Bio and Algebra 1 or equivalent

UC/CSU (A-G) Requirement: G

Brief Course Description: Environmental Horticulture is a hands-on approach to greenhouse/garden plant growth, production, and sales. This course is designed to provide students with exploration of the multitude of career options available in the green industry. Students will develop and maintain the foundations of modern plant science including: plant structure, growth, and environmental needs. This course will work collaboratively with Mesa's Culinary Academy to provide fruits/vegetables through the planting, propagation, pruning, and maintenance until they are ready for marketing. Environmental Horticulture will serve as a foundation to relevant biological principles and improvements regarding scientific literacy amongst students. This course will meet the Life Science requirement for graduation as well as the "G" elective requirement for UC/CSU schools.

I. Goals

The student will:

- A. Apply scientific applications of Investigation/Experimentation standards (1.2)
 - 1.a Select and use appropriate tools and technology
 - 1.c Identify possible reasons for inconsistent results (sources of error or uncontrollable conditions)
 - 1.d Formulate logical explanations for experimental errors
 - 1.j Recognize issues of statistical variability and need for controlled tests
 - 1.l Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
 - 1.m Investigate science-based societal issues by researching the literature, analyzing data, and communicating findings.

- B. Utilize specific applications of Algebra 1 standards (1.1)
 - 10.0 Students will add, subtract, multiply and divide monomials and polynomials. Students solve multistep problems by using techniques.
 - 15.0 Students will apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
 - 8.0 Students will know, derive, and solve problems involving perimeter, circumference, area, volume, lateral area, and surface area.
 - 11.0 Determine changes in dimensions affecting perimeter, area, and volume

- C. Specific applications of Principles of Economics standards (1.3)
 - 12.2 Analyze elements of America's market economy in a global setting
 - 12.2.2 Discuss effects/changes in supply/demand on relative scarcity, price, and quantity of products.
 - 12.2.5 Understand process by which competition among buyers/sellers determines market price
 - 12.2.10 Discuss economic principles that guide the location of agricultural production and industry and the spatial distribution of transportation and retail facilities.

- D. Students will understand principles of effective oral, written, and multimedia communication in a variety of formats and contexts. (Communications 2.0)
 - 1.6 Writing: Develop presentations using clear research questions and creative and critical research strategies
 - 2.6 Writing: Deliver multimedia presentations

- E. Students understand how to make effective decisions, use career information, and manage personal career plans (Career Planning/Mgmt 3.0)
 - 3.1 Know personal qualifications, interests, aptitudes, information, and skills necessary to succeed in careers.
 - 3.2 Understand scope of career opportunities educational Requirements

- F. Agricultural Mechanics: Students will understand land measurement and construction techniques commonly used in agriculture (B12.0)
 - B12.1 Understand common techniques used in agriculture (leveling, measurement, layout)
 - B12.4 Install plumbing in agricultural structures (drip irrigation)

- G. Agriscience: Students will study California agriculture, business, technologies, natural resources, and animal, plant, and soil sciences (C)
 - C1.1 Understand Ca. agricultural history
 - C1.2 Understand how agriculture affects quality of life
 - C1.4 Understand economic impact of Ca agricultural commodities

- C1.5 Understand economic impact of major natural resources of Ca.
- C2.0 Understand the interrelationship between agriculture and the environment.
 - C2.1 Understand impacts on solid, water, and air
 - C2.2 Understand current agricultural environmental challenges.
 - C2.4 Compare/contrast practices for conserving renewable and non-renewable resources
 - C2.5 Understand how new energy sources are developed from agricultural products (ethanol, methane, etc)
- C3.3 Understand public concern for technological advancements in agriculture (GMO's)
- C5.0 Understand cell structure/function of plants/animals
- C10.2 Understand soil science principles (pH, structure, texture)
- C10.3 Understand water delivery and irrigation systems
- C11.1 Understand anatomy and functions of plant systems
- C11.2 Understand plant growth requirements
- C11.3 Know annual, biennial, perennial plant life cycles
- C11.4 Know plant sexual and asexual reproduction
- C11.5 Understand complete photosynthesis process
- C11.6 Understand complete respiration process
- C12.1 Understand major pest classifications (insects, weeds, disease)
- C12.2 Understand pest management techniques
- C13.2 Analyze animal and plant problems and devise solutions based on the scientific method.

H. Natural Resources: understand the relationship between California's resources and the environment. Students will understand energy and nutrient cycles, water resources and management, and soil conservation (E)

- E1.0 Understand and analyze importance of energy cycles
- E1.4 Compare the effects on air and water quality using different forms of energy
- E2.0 Understand air and water use, management practices, and conservation strategies
- E8.0 Students will understand basic plant physiology, anatomy, and taxonomy
- E8.4 Recognize factors that influence growth (temperature, nutrients, photosynthesis)

I. Ornamental Horticulture: prepare students for careers in plant sciences. Topics include plant identification, physiology, soil science, reproduction, landscaping, and floriculture (F)

- F2.0 Understand plant systems, nutrient transportation, structure, and energy storage
- F6.0 Understand ornamental plant nutrition practices (primary/secondary)
- F8.3 Understand how to propagate/maintain crops to point of sale

- F8.4 Understand marketing and merchandising principles in production
- F9.0 Understand use of containers, tools, equipment, and facilities

- J. Plant and Soil Science: covers topics including plant classification, physiology, reproduction, plant breeding, biotechnology, and pathology (G)
 - G5.3 Know conventional, sustainable, and organic management methods
 - G7.1 Know effective tillage, compost, soil conservation techniques
 - G8.2 Understand local, state, federal agencies that regulate water quality and availability
 - G8.3 Understand the definition of watershed and how it is used to measure quality.
 - G9.1 Understand how to identify and classify plants in agricultural system (producers, consumers, decomposers)
 - G9.2 Understand elements of conventional, sustainable, organic production
 - G10.1 Understand techniques including monitoring, pruning, fertilization, planting, irrigation, harvesting, processing, packaging in all areas of plant production.
 - G10.3 Understand general maturity and harvest-time guidelines for specific plants
 - G11.1 Understand biotechnology practices (micropropagation, biological pest controls, and genetic engineering)
 - G11.5 Understand biotechnology effects (pros and cons) on consumers and industry.

II Outline of Content for Major Areas of Study

Semester I:

- A. Horticulture Background/History/Components
 - 1. Divisions of Horticulture
 - 2. Careers in Horticulture
 - 3. Taxonomy of plants
 - 4. Environmental Horticulture-Best Management Practices
 - 5. Scientific Methodology
- B. Plant Anatomy and Physiology
 - 1. Cells, tissues, plant parts
 - 2. Photosynthesis and Respiration
 - 3. Functions of plant parts, vegetative structure of plants
 - 4. Developmental stages and life cycles of plants
 - 5. Plant Classification
- C. Growth Environments
 - 1. Climate, Weather and Horticulture

2. Soil quality (texture, structure, pH, components, temperature, trace minerals)
3. Growing media
4. Compost and Fertilizers
5. Growth regulators
6. Controlled Environments (greenhouse) versus Landscaping
7. Greenhouse Gases-global environmental impact

- D. Olericulture-Vegetable Production, Pomology-Fruit and Nuts, and Herbs
1. Origin, classification, importance of vegetables
 2. History and impact of California commodities
 3. Growth and production of vegetables from seed-harvest including proper journaling
 4. Plant identification, species, heirlooms
 5. Market-driven demands/economic trends
 6. Local plant marketing and sales

Semester II:

- E. Technology in Horticulture
1. Tool selection, care, safety and usage
 2. Greenhouse and landscape maintenance
 3. Irrigation Methods – Water cycle/conservation
 4. Landscaping of gardens- design/layout/construction
- F. Disease and Pest Control
1. Organics versus chemical controls
 2. Safety practices
 3. Biological, Cultural, and Legislative Controls
 4. Rodent, pest, and disease identifiers
- G. Reproduction and Propagation
1. Sexual versus Asexual Reproduction
 2. Asexual Propagation (cutting, grafting, splicing, budding, layering, micropropagation)
 3. Plant Breeding/Propagation Methods
 4. Mendelian Genetics, Inheritance, and Hybridization
 5. Biotechnology and Engineering (including controversies)
 6. Germination to Harvest (techniques, cycles, seasonal impacts)
- H. Techniques and Handling
1. Floral Design
 2. Turf Management
 3. Postharvest Handling/Marketing of Products

III. Accountability Determinants:

A. Key Assignments:

1. Career research – guest speaker report
2. Heirloom history and seed choice lab. Students will seed, track, journal growth, and harvest plants for consumption/sales=ongoing yearlong assignment
3. Photosynthesis Lab-oxygen measurement
4. pH lab-testing of various soil samples
5. Soil Science lab-identifying structure and textures of soil samples
6. Plant identification and taxonomy lab
7. Greenhouse Gases Lab-analyze greenhouse gases and their effects
8. Water Cycle Lab-Demonstration and model of water cycle
9. Internet Webquest-Research and develop crop production and sales based on market economy and demands
10. Plant Journals-ongoing assignment of drawings, measurements and notes
11. Organic versus Inorganic? Research Project and Presentation
12. Pest/Disease Identification Lab Practicum
13. Landscape Design Project-layout and design
14. Propagation research, methodology, and trial of a specific type.
15. Marketing and sales of products

B. Assessment Methods:

1. Individual Performance on labs, quizzes, and tests
2. Performance on labs and formal lab write-ups using scientific method
3. Observations of daily participation in garden/greenhouse/classroom
4. Observations and evaluation of collaborative activities in class/garden/greenhouse
5. Successful completion of individual's plant production (seed-to-harvest)
6. Participation in marketing of plant production and sales

IV. Instructional Materials and Methodologies:

A. Required Textbook(s)

Introduction to Horticulture: Fifth Edition

Pearson, 2013 (Interstate Agriscience and Technology Series)

B. Supplementary Materials

C. Instructional Methodologies