

Las Positas College  
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### Course Outline for VWT 12

## LANDSCAPE AND VINEYARD SOILS, FERTILIZERS, AND IRRIGATION

Effective: Fall 2018

### I. CATALOG DESCRIPTION:

VWT 12 — LANDSCAPE AND VINEYARD SOILS, FERTILIZERS, AND IRRIGATION — 3.00 units

This course is a study of the physical, chemical and biological properties of soil. Areas of study will include: soil classification, derivation, uses, function and management including erosion, moisture retention, structure, cultivation, organic matter and microbiology. There is a focus on vineyard and landscape planting media, soil substitutes, hydroponics, and amendments to improve and promote plant growth which includes plant and vine nutrition, essential nutrients required for plant growth and healthy development. There will be instruction covering materials used for fertilizers which includes material origins, use, and application; and irrigation systems which will cover materials required for basic irrigation systems used in vineyard and landscape settings. Students that take HORT 54 may not receive credit for VWT 12.

2.50 Units Lecture 0.50 Units Lab

#### Grading Methods:

Letter Grade

#### Discipline:

- Agriculture Production or
- Ornamental Horticulture

	<b>MIN</b>
<b>Lecture Hours:</b>	45.00
<b>Expected Outside of Class Hours:</b>	90.00
<b>Lab Hours:</b>	27.00
<b>Total Hours:</b>	162.00

### II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

### III. PREREQUISITE AND/OR ADVISORY SKILLS:

### IV. MEASURABLE OBJECTIVES:

**Upon completion of this course, the student should be able to:**

- A. Identify the principal components of soil and soil profiles
- B. Describe the physical soil properties of texture and minerals and explain how they contribute to soil structure;
- C. Describe how soil porosity contributes to how water moves through soils
- D. Explain how water is stored in different soil types
- E. Explain the physical process of evapotranspiration
- F. Explain how man-made or natural drainage systems assist in managing soil water infiltration;
- G. Explain the causes and effects of water erosion
- H. Compare and contrast the essential nutritional needs of a grapevine opposed to the essential nutritional needs of other plants
  - I. Describe numerous irrigation system options including drip, sprinkler and furrow
- J. Monitor all aspects of an irrigation system including the mechanical components and the programming of the irrigation controller which distributes the water to the plants
- K. Set up an irrigation schedule in a vineyard or landscape reflecting the seasonal needs of the location
- L. Diagnose problems related to soils, fertilizers and irrigation
- M. Apply knowledge of the biology and chemistry of decomposition of organic matter to the operation of a composting system

### V. CONTENT:

- A. General introduction
  1. Concept of soil
  2. Soil profile
  3. Soil as a medium of plant growth
- B. Physical soil properties
  1. Soil texture
  2. Soil minerals
  3. Soil structure
  4. Effects of structure on plant growth and soil water
  5. Soil and plant tissue testing and analysis

- 6. Soil conservation
- C. Soil air and water
  - 1. Soil porosity and saturation
  - 2. Soil water – physical and chemical characteristics
  - 3. Soil plant water relationships
  - 4. Moisture states of soil and their measurement
- D. Water in soil plant systems
  - 1. Water storage in soil
  - 2. Water content and water potential
  - 3. Water movement in soil
  - 4. Water stress in plants
  - 5. Evapotranspiration
- E. Managing soil water and irrigation
  - 1. Water infiltration
  - 2. Water drainage in soil
    - a. Natural
    - b. Man-made
- F. Soil erosion
  - 1. Causes and effects of water erosion
  - 2. Managing erosion
  - 3. Watershed monitoring and stream protection
- G. Fertilizers
  - 1. Grapevine mineral nutrition
  - 2. Essential plant nutrients
  - 3. Fertilizer formulations
  - 4. Vineyard fertilization materials
  - 5. Methods of applying vineyard fertilizers
  - 6. Fertigation and foliar feeding
  - 7. Diagnosing nutrient problems
- H. Irrigation methods
  - 1. Drip
  - 2. Sprinkler
  - 3. Furrow
- I. Irrigation monitoring
  - 1. Mechanical
  - 2. Interpretive
- J. Irrigation scheduling
  - 1. Evapotranspiration data
  - 2. Soil types
  - 3. Site specifics
- K. Diagnosing problems related to soils, fertilizers and irrigation
  - 1. Hardpans
  - 2. Unbalanced fertilizers
  - 3. Pests
  - 4. PVC failure
  - 5. Calcium
- L. Methods of creating compost from waste products
  - 1. Carbon
  - 2. Nitrogen
  - 3. Moisture

## VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. **Discussion** -
- C. **Audio-visual Activity** - Media presentations
- D. **Field Trips** -
- E. **Demonstration** -

## VII. TYPICAL ASSIGNMENTS:

- A. Read a chapter on soil horizons and profiles.
- B. Write a 3 page paper on how evapotranspiration data assists in irrigation scheduling.
- C. Collect at least 3 soil samples from any vineyard or landscape and prepare to perform the soil plasticity test in class.
- D. Using the supplied materials of PVC glue, primer, pvc piping, and fittings, complete a secure and successful bond of piping to miscellaneous fittings.

## VIII. EVALUATION:

- A. **Methods**
  - 1. Exams/Tests
  - 2. Quizzes
  - 3. Papers
  - 4. Field Trips
  - 5. Group Projects
  - 6. Class Participation
  - 7. Home Work
  - 8. Final Performance
- B. **Frequency**
  - 1. At least two exams/tests/quizzes per semester
  - 2. At least one written paper (approximately 2-4 pages) per semester
  - 3. At least one scheduled field trip off campus
  - 4. At least one group project per semester
  - 5. Daily class participation
  - 6. Weekly homework
  - 7. Final presentation of group project

## IX. TYPICAL TEXTS:

- 1. White, Robert. *Understanding Vineyard Soils*. 2nd ed., Oxford University Press, 2015.
- 2. Bechdal, Brian. *Soil Science and Management*. 1st ed., Callisto Reference, 2015.

3. Lal, Rattan, and B. Stewart. *Soil Management of Smallholder Agriculture (Advances in Soil Science)*. 1st ed., C.R.C. Press, 2014.
4. Weil, Ray, and Nile Brady. *The Nature and Properties of Soils*. 15th ed., Pearson, 2016.
5. Johnson, Nancy, Catherine Gehring, and Jan Jansa. *Mycorrhizal Mediation of Soil: Fertility, Structure, and Carbon Storage*. 1st ed., Elsevier, 2016.
6. Huffman, Rodney, Delmar Fangmeier, William Elliot, and Stephen Workman. *Soil and Water Conservation Engineering*. 7th ed., American Society of Agricultural Engineers, 2013.
7. Wang, Henry. *Soil Ecology and Land Use Management*. 1st ed., ML Books International, 2016.
8. Havlin, John. *Soil Fertility and Fertilizers*. 8th ed., Pearson, 2014.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Appropriate sturdy footwear, and personal protective equipment, such as ear plugs, gloves, and safety glasses must be worn during certain lab activities, such as motorized equipment operation.