

NORTHEAST IOWA COMMUNITY COLLEGE
Calmar/Peosta

Course Guide for: **SOILS FOR VITICULTURE**

1.0 COURSE TITLE: Soils for Viticulture

2.0 CATALOG NUMBER: AGA:142 (VIN 293)

3.0 SEMESTER HOUR CREDIT: 3

4.0 LECTURE HOURS: 40

5.0 LAB HOURS: 16
Online Activities

6.0 COURSE DESCRIPTION:

The course will explore soil properties and behavior and their influence on wines. The course focuses not only on growth and production, but on the long-term effects of viticulture on soil quality and the wider environment.

6.1 Prerequisite(s): None

7.0 GENERAL COURSE GOAL(S):

The students will be able to select sites for a new vineyard, and help manage soils in existing vineyards.

8.0 MAJOR UNITS OF INSTRUCTION:

- 8.1 Why Soil is Important in Viticulture
- 8.2 Site Selection and Soil Preparation
- 8.3 The Nutrition of Grape Vines
- 8.4 Soil Fertility and Chemistry
- 8.5 The Primary Nutrients
- 8.6 The Secondary and Micronutrients
- 8.7 Soil Testing and Interpretation
- 8.8 Plant Nutrients and the Environment
- 8.9 Where the Vine Roots Live
- 8.10 The Living Soil
- 8.11 Putting It All Together

9.0 UNIT OBJECTIVES:

9.1 Unit One Objectives

At the end of this unit, the student will be able to:

- 9.11 Identify layers of a soil profile.
- 9.12 Explain how soil forms.
- 9.13 Debate the concept of Terroir.
- 9.14 Use the web based soil survey to analyze land

9.2 Unit Two Objectives

At the end of this unit, the student will be able to:

- 9.2.1 List the steps and factors important in site selection.
- 9.2.2 Determine soil texture using the textural triangle.
- 9.2.3 List the steps in preparing a site for a vineyard.

9.3 Unit Three Objectives

At the end of this unit, the student will be able to:

- 9.3.1 Explain the difference between macro and micro nutrients.
- 9.3.2 Explain how vine roots absorb nutrients.
- 9.3.3 Describe the process in which soil nutrients become available.
- 9.3.4 List the procedure for petiole analyses.
- 9.3.5 Interpret petiole analysis results.
- 9.3.6 List the procedures for taking a soil sample.
- 9.3.7 Interpret a soil test report.
- 9.3.8 Describe the nitrogen and phosphorous cycles
- 9.3.9 Debate the benefits of organic and precision viticulture

9.4 Unit Four Objectives

At the end of this unit, the student will be able to:

- 9.4.1 List the 16 nutrients required for a plant to grow normally
- 9.4.2 Explain how soil texture and structure affect plant growth.
- 9.4.3. Recognize the role of cation exchange in plant nutrition.
- 9.4.4. Discuss the important contributions of organic matter to soil properties.
- 9.4.5. Explain soil pH and the pH scale.
- 9.4.6. Explain how lime works in the soil and list common liming materials.
- 9.4.7. Calculate the ECCE, CCE, neutralizing value, and size reactivity of liming material.
- 9.4.8. Calculate amounts of liming materials that should be applied to achieve the recommended lime requirements from a soil test report.
- 9.4.9. Describe how soil pH affects nutrient availability.
- 9.4.10. List the process or practices that cause soil pH to change.
- 9.4.11. Define soil solution and describe its relationship to nutrient availability.
- 9.4.12. Describe the concept of buffering capacity.
- 9.4.13. Explain the importance of the C:N ratio in the soil.
- 9.4.14. Define and calculate base saturation of a soil.

9.5 Unit Five Objectives

At the end of this unit, the student will be able to:

- 9.5.1 Describe the functions of Nitrogen, Phosphorous, and Potassium in crop growth.
- 9.5.2. Describe and explain the nitrogen cycle.
- 9.5.3. Describe symbiotic nitrogen fixation.
- 9.5.4. Recognize how physical properties and cropping systems affect nitrogen, phosphorous, and potassium fertilization.
- 9.5.5. Describe the properties of the common nitrogen fertilizers and their advantages and disadvantages.
- 9.5.6. Recognize how the soil retains phosphorous and potassium.
- 9.5.7. Describe how immobilization and mineralization affect nutrient availability.

- 9.5.8. Discuss the role of potassium in the plant and the concept of luxury consumption.
- 9.5.9. List the analysis, physical form, and handling precautions of each of the following inorganic fertilizer sources: normal superphosphate, superphosphoric acid, triple superphosphate, and diammonium phosphate, potassium chloride, potassium sulfate, potassium nitrate.
- 9.5.10. Recognize how fertilizer placement and time of application affect nutrient availability.
- 9.5.11. Discuss plant deficiency symptoms for nitrogen, phosphorous, and potassium.

9.6 Unit Six Objectives

At the end of this unit the student will be able to:

- 9.6.1 Discuss the role of the secondary and micronutrients in plant growth.
- 9.6.2. Recognize the plant deficiency symptoms of the secondary and micronutrients
- 9.6.3. List methods of correcting secondary and micronutrients deficiencies.
- 9.6.4. List the ionic form of which each nutrient is available to plants.

9.7 Unit Seven Objectives

At the end of this unit, the student will be able to:

- 9.7.1 Explain the procedures used in soil sampling.
- 9.7.2. Discuss soil test results and cost of soil testing.
- 9.7.3. Use a soil survey to locate a tract of land.
- 9.7.4. Discuss the results of soil test summaries.
- 9.7.5. Use a soil survey to describe characteristics of a soil profile of a tract of land.
- 9.7.6. Recognize the purpose of plant tissue analysis and describe how it is used in a soil fertility program.
- 9.7.7. Describe how to sample and submit plant samples for tissue analysis.
- 9.7.8. Explain how soil test values are used to make fertilizer recommendations.
- 9.7.9. Calculate nitrogen credits from animal wastes, sludges, legumes, and soil organic matter.
- 9.7.10. Determine which of two fertilizer products is most economical.

9.8 Unit Eight Objectives

At the end of this unit, the student will be able to:

- 9.8.1 Discuss the impact of fertilizer use on the environment.
- 9.8.2. Explain how nitrogen losses affect the environment.
- 9.8.3. Explain the concepts of Best Management Practices and Integrated Crop Management.
- 9.8.4. Explain how site specific soil management can benefit the environment

9.9 Unit Nine Objectives

At the end of this unit, the student will be able to:

- 9.9.1 Calculate soil porosity
- 9.9.2 Calculate soil water content
- 9.9.3 Describe a well structured soil
- 9.9.4 Estimate soil water availability
- 9.9.5 Manage soil water with irrigation
- 9.9.6 Describe an irrigation system appropriate for a vineyard in their area.
- 9.9.7 Debate the benefits of cover crops and mulches.

9.10 Unit Ten Objectives

At the end of this unit the student will be able to:

- 9.10.1 Explain the soil/carbon cycle
- 9.10.2 Define soil biomass
- 9.10.3 List the functions and types of decomposers
- 9.10.3 List the functions and types of reducers
- 9.10.4 Explain nitrogen fixation
- 9.10.5 Describe the impact of soil borne pests on a vineyard

9.11 Unit Twelve Objectives

At the end of this unit the student will be able to:

- 9.11.1 Define the ideal soil
- 9.11.2 Design a vineyard incorporating all aspects of the course.

10.0 INSTRUCTIONAL METHODOLOGIES:

- 10.1 Online instruction, discussions, and supplemental printed and web-based material will be used to present the subject matter.
- 10.2 Written assignments and other projects will be used to reinforce concepts.

11.0 GRADING CRITERIA:

- 11.1 The instructor will provide the grading criteria to students at the beginning of the course.
- 11.2 Grades will be assigned for work completed using the letter grades identified in the school catalog.