



ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Natural Sciences and Business

COURSE: AGR 1217 Soil Fertility and Fertilizers

Date: Spring 2023

Credit Hours: 3

Complete all that apply or mark "None" where appropriate:

Prerequisite(s): None

Enrollment by assessment or other measure? Yes No
If yes, please describe:

Corequisite(s): None

Pre- or Corequisite(s): None

Consent of Instructor: Yes No

Delivery Method: **Lecture** **3 Contact Hours** (1 contact = 1 credit hour)
 Seminar **0 Contact Hours** (1 contact = 1 credit hour)
 Lab **0 Contact Hours** (2-3 contact = 1 credit hour)
 Clinical **0 Contact Hours** (3 contact = 1 credit hour)

Offered: **Fall** **Spring** **Summer**

CATALOG DESCRIPTION and IAI NUMBER (if applicable):

A study of the fundamental concepts of soil fertility and fertilizers used in agriculture and related fields. Students will become familiar with plant nutrition, factors affecting plant growth, macro and micro-nutrients, fertilizer recommendations, and application methods.

ACCREDITATION STATEMENTS AND COURSE NOTES:

None

COURSE TOPICS AND CONTENT REQUIREMENTS:

1. Concepts of Soil Fertility and Productivity
 - a. Essential Plant Nutrients
 - b. Soil Texture and Structure
 - c. Soil Colloids and Ions
 - d. Cation Exchange Capacity
 - e. Anion Retention in the Soil
 - f. Soil Organic Matter
2. Soil pH and Liming
 - a. Factors Affecting Soil pH
 - b. Determining Agrilime Requirements
 - c. Soil Acidity
 - d. Agrilime Applications
 - e. Crop Response
3. Nitrogen
 - a. What is Nitrogen?
 - b. Plant Deficiency Symptoms
 - c. Nitrogen and Water Use Efficiency
 - d. Soil N Transformations
 - e. Mineralization and Immobilization of Nitrogen
 - f. Nitrification and Denitrification
 - g. Nitrogen Fixation
 - h. Nitrogen Loss
 - i. Sources of Nitrogen
4. Phosphorus
 - a. What is Phosphorus?
 - b. Roles of Phosphorus in Plants
 - c. Plant Deficiency Symptoms
 - d. Sources and Amounts of Phosphorus in Soils
 - e. Movement in Soils
 - f. Factors Affecting Availability
 - g. Application Methods
 - h. Phosphate Fertilizer Sources
5. Potassium
 - a. What is Potassium?
 - b. Roles of Potassium in Plants
 - c. Plant Deficiency Symptoms
 - d. Forms of Potassium in the Soil
 - e. Fertilizer Potassium in the Soil
 - f. Potassium Cycle
 - g. Soil Factors Affecting Availability
 - h. Application Methods
 - i. Potassium Fertilizer Sources

6. Secondary Nutrients
 - a. What are Secondary Macro-nutrients?
 - b. Calcium
 - i. Role in Plants
 - ii. Deficiency Symptoms
 - iii. Calcium in the Soil
 - iv. Sources of Calcium
 - c. Magnesium
 - i. Role in Plants
 - ii. Deficiency Symptoms
 - iii. Magnesium in the Soil
 - iv. Sources of Magnesium
 - d. Sulfur
 - i. Role in Plants
 - ii. Deficiency Symptoms
 - iii. Sulfur in the Soil
 - iv. Sources of Sulfur
7. Micronutrients
 - a. What are Micronutrients?
 - b. Soil-Plant Relationships
 - c. Boron
 - d. Chloride
 - e. Copper
 - f. Iron
 - g. Manganese
 - h. Molybdenum
 - i. Nickel
 - j. Zinc
 - k. Cobalt
8. Soil Sampling
 - a. Procedures
 - b. Sampling Intensity
 - c. Home Gardens and Lawns
9. Soil Testing, Plant Analysis, and Diagnostic Techniques
 - a. Soil Testing
 - b. Interpreting Soil Test Results
 - c. Plant Analysis
 - d. Tissue Testing
 - e. Cultural Practices
10. Fertilize for Profits
 - a. Introduction
 - b. Fertilizer and Profitability
 - c. Yield versus Profitability
 - d. Long term Effects
 - e. Site-Specific Application

11. Plant Nutrients and the Environment

- a. Nitrogen and Phosphorus Effects on the Environment
- b. Effects of Secondary Macronutrients on the Environment
- c. Nutrient Management Plans

INSTRUCTIONAL METHODS:

- Lecture
- Discussion
- Assignments
- Field Trips
- Projects

EVALUATION OF STUDENT ACHIEVEMENT:

A= 90-100

B= 80-89

C= 70-79

D= 60-69

F= 0-59

Exams: 50%

Quizzes 30%

Homework 20%

INSTRUCTIONAL MATERIALS:

Textbooks

Havlin, J.L., S.L. Tisdale, W.L. Nelson, J.D. Beaton. 2014. Soil Fertility and Fertilizers
8th Ed. Pearson. ISBN-13: 9780135033739

Potash and Phosphate Institute. 2003. Soil Fertility Manual. PPI Research and
Education. Norcross, GA. ISBN: 0-9629598-5-5

Resources

- Crop Sciences Extension and Outreach. 2017. Illinois agronomy handbook.
University of Illinois. <http://extension.cropsciences.illinois.edu/handbook/> (accessed
31 Jan. 2023).
- University of Illinois Extension publications.
<http://web.extension.illinois.edu/state/index.php>
- Iowa State University Extension and Outreach Extension Store publications.
<https://store.extension.iastate.edu/>.
- Purdue University Extension publications.
<https://extension.purdue.edu/Pages/default.aspx>

LEARNING OUTCOMES AND GOALS:

Institutional Learning Outcomes

- 1) Communication – to communicate effectively;
- 2) Inquiry – to apply critical, logical, creative, aesthetic, or quantitative analytical reasoning to formulate a judgement or conclusion;
- 3) Social Consciousness – to understand what it means to be a socially conscious person, locally and globally;
- 4) Responsibility – to recognize how personal choices affect self and society.

Course Outcomes and Competencies

1. Summarize and defend the relationship of soil fertility to crop productivity.
2. Recommend methods and appropriate products to adjust soil pH.
3. Describe and critique products used to adjust soil pH.
4. Compare and contrast the role of nitrogen, phosphorus, potassium, and micro-nutrients in crop growth and production.
5. Identify plant nutrient deficiency symptoms.
6. Calculate, recommend, and justify fertilizer application rates for grain and forage crops grown in the Midwest using soil test data.
7. Differentiate between types of fertilizers and sources of nutrients.
8. Explain and recommend fertilizer timing and application methods.
9. Evaluate the economic impacts of soil fertility and fertilizer selection.