



ILLINOIS VALLEY COMMUNITY COLLEGE

COURSE OUTLINE

DIVISION: Natural Sciences Business

COURSE: AGR 1217 Soil Fertility and Fertilizers

Date: 10/23/2017

Credit Hours: 3 Credit Hours

Prerequisite(s): None

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)**
 Online
 Blended

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

IAI Equivalent –**Only for Transfer Courses**-go to <http://www.itransfer.org>:

CATALOG DESCRIPTION:

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.

GENERAL EDUCATION GOALS ADDRESSED

[See last page for Course Competency/Assessment Methods Matrix.]

Upon completion of the course, the student will be able:

[Choose up to three goals that will be formally assessed in this course.]

- To apply analytical and problem solving skills to personal, social, and professional issues and situations.
- To communicate successfully, both orally and in writing, to a variety of audiences.
- To construct a critical awareness of and appreciate diversity.
- To understand and use technology effectively and to understand its impact on the individual and society.
- To develop interpersonal capacity.
- To recognize what it means to act ethically and responsibly as an individual and as a member of society.
- To recognize what it means to develop and maintain a healthy lifestyle in terms of mind, body, and spirit.
- To connect learning to life.

EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

[Outcomes related to course specific goals. See last page for more information.]

Upon completion of the course, the student will be able to:

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.

MAPPING LEARNING OUTCOMES TO GENERAL EDUCATION GOALS

[For each of the goals selected above, indicate which outcomes align with the goal.]

Goals	Outcomes
First Goal	
To apply analytical and problem solving skills to personal, social, and professional issues and situations.	<ol style="list-style-type: none"> 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.

	<ol style="list-style-type: none"> 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.
Second Goal	
Third Goal	

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 Aglime Requirements
 - c. Soil Acidity
 - d. Aglime 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

INSTRUCTIONAL MATERIALS:

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

STUDENT REQUIREMENTS AND METHODS OF EVALUATION:

A= 90-100

B= 80-89

C= 70-79

D= 60-69

F= 0-59

Exams: 50%

Quizzes: 30%

Homework: 20%

OTHER REFERENCES

Crop Sciences Extension and Outreach. 2017. Illinois agronomy handbook. University of Illinois. <http://extension.cropsciences.illinois.edu/handbook/> (accessed 22 Oct. 2017).

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>

Course Competency/Assessment Methods Matrix

(Dept/# Course Name)	Assessment Options																																				
For each competency/outcome place an "X" below the method of assessment to be used.	Assessment of Student Learning	Article Review	Case Studies	Group Projects	Lab Work	Oral Presentations	Pre-Post Tests	Quizzes	Written Exams	Artifact Self Reflection of Growth	Capstone Projects	Comprehensive Written Exit Exam	Course Embedded Questions	Multi-Media Projects	Observation	Writing Samples	Portfolio Evaluation	Real World Projects	Reflective Journals	Applied Application (skills) Test	Oral Exit Interviews	Accreditation Reviews/Reports	Advisory Council Feedback	Employer Surveys	Graduate Surveys	Internship/Practicum /Site Supervisor Evaluation	Licensing Exam	In Class Feedback	Simulation	Interview	Written Report	Assignment					
	Direct/ Indirect	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	I	I	I	I	D	D						D					
	Summarize and defend the relationship of soil fertility to crop productivity.	D							X	X				X																							X
	Recommend methods and appropriate products to adjust soil pH.	D							X	X				X																							X
	Describe and critique products used to adjust soil pH.	D							X	X				X																							X
	Compare and contrast the role of nitrogen, phosphorus, potassium, and micro-nutrients in crop growth and production.	D							X	X				X																							X

Identify plant nutrient deficiency symptoms.	D									X	X																													X			
Calculate, recommend, and justify fertilizer application rates for grain and forage crops grown in the Midwest using soil test data.	D									X	X																														X		
Differentiate between types of fertilizers and sources of nutrients.	D									X	X												X																			X	
Explain and recommend fertilizer timing and application methods.	D									X	X												X																			X	
Evaluate the economic impacts of soil fertility and fertilizer selection.	D									X	X												X																			X	