AGRO 2051

Soil Science (4) *Prereq: CHEM 1002, 1212 or equivalent. 3 hrs. lecture; 2 hrs. lab.*

Principles of soil science; properties of soils related to plant growth and the environment.

Lecture 134 Madison Sturgis
Lab 241 Madison Sturgis

Instructor Lewis Gaston

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Hours 9:40 - 10:30 MW

Grading

90	A
80	B
70	C
60	D
Below	F

Components

Lecture

Quizzes / Problems		10 %
Exam 1	15 %	
Exam 2	15 %	
Exam 3	15 %	
Exam 4	15 %	
Final Exam		15 %

Lab

Participation / Lab Exercises / Quizzes		10 %
Exam 1	10 %	
Exam 2	10 %	

Total[¶] 100 %

[¶] See *Comments*

Comments

Lecture

Final exam is cumulative but with emphasis on material covered since Exam 4.

Lowest exam (1 through 4) dropped.
No make-up exams.

Lowest two quizzes / problem sets dropped.
No make-up quizzes.

Lab

Make-up exam to be arranged with lab instructor.

Text

The Nature and Properties of Soils, 13th Edition

N.C. Brady and R.R. Weil

Lab Manual

AGRO 2051 Lab Manual

Other Materials

agronomy.lsu.edu/courses/agro2051/index.htm

Educational Objectives

Technical / Subject-Specific

See below. Mastery of these topics provides a basic understanding of soil science and the foundation for advanced study (soil environmental chemistry, fertility, genesis, microbial ecology, physics, wetland biogeochemistry and so forth).

General

Success requires not only technical knowledge and skills, but also general skills, like the ability to read and write well, communicate and cooperate in person, and solve new problems. To the extent possible, this course offers the opportunity to further develop such general skills. Teamwork and problem solving are especially emphasized.

M	W	F	
23 AUGUST Introduction (Chapter 1) **Lab 1 Texture**	**25** Introduction **Lab 1 Texture**	**27** Physical Properties (Chapter 4) **Quiz 1 Introduction**	
30 Physical Properties **Lab 2 Bulk and Particle Densities**			
	1 SEPTEMBER Physical Properties **Lab 2 Bulk and Particle Densities**	**3** Soil Formation (Chapter 2) **Quiz 2 Physical Properties**	
6 **LABOR DAY**	**8** Soil Formation **NO LAB**	**10** Classification (Chapter 3) **Quiz 3 Soil Formation**	
13 Soil Classification **Lab 3 Profile Description**	**15** Soil Survey (Chapter 19) **Lab 3 Profile Description**	**17** Soil Water (Chapter 5) **Quiz 4 Soil Survey**	
20 Soil Water **Lab 4 Soil Survey**	**22** Review Chapters 1, 2, 3, 4 and 19 **Lab 4 Soil Survey**	**24** **EXAM 1**	
27 Field Water Cycle (Chapter 6) **Lab 5 Hydraulic Conductivity**	**29** Field Water Cycle **Lab 5 Hydraulic Conductivity**		
		1 OCTOBER Soil Air and Temperature (Chapter 7) **Quiz 5 Soil Water / Field Water Cycle**	
4 Soil Air and Temperature **Lab 6 Ion Exchange**	**6** Soil Colloids (Chapter 8) **Lab 6 Ion Exchange**	**8** **FALL HOLIDAY**	
11 Soil Colloids **LAB EXAM 1**	**13** Review Chapters 5, 6 and 7 **LAB EXAM 1**	**15** **EXAM 2**	
18 Soil pH (Chapter 9) **Lab 7 pH and Liming**	**20** Soil pH **Lab 7 pH and Liming**	**22** Salinity (Chapter 10) **Quiz 6 Colloids and pH**	
25 Organic Organisms (Chapter 11) **Lab 8 Soil Biology**	**27** Review Chapters 8, 9 and 10 **Lab 8 Organic Biology**	**29** **EXAM 3**	
1 NOVEMBER Soil Organisms **Lab 9 Organic Matter**	**3** Organic Matter (Chapter 12) **Lab 9 Organic Matter**	**5** Macronutrients (Chapters 13 and 14) **Quiz 7 Organism and Organic Matter**	
8 Macronutrients **Lab 10 Soil Fertility**	**10** Macronutrients **Lab 10 Soil Fertility**	**12** Micronutrients (Chapter 15) **Quiz 8 Macronturients**	
15 Nutrient Management (Chapter 16) **Lab 10 Soil Fertility**	**17** Review Chapters 11, 12, 13, 14 and 15 **Lab 10 Soil Fertility**	**19** **EXAM 4**	
22 Nutrient Management (Chapter 16) **Lab 11 Chemical Mobility**	**24** Nutrient Management **Lab 11 Chemical Mobility**	**26** **THANKSGIVING HOLIDAY**	
29 Chemical Pollution (Chapter 18) **LAB EXAM 2**			
	1 DECEMBER Erosion (Chapter 17) **LAB EXAM 2**	**3** Erosion / Review Chapters 16, 17 and 18	**7** **FINAL EXAM**

SUBJECT-SPECIFIC OBJECTIVES

Topic	Know and Understand
Introduction Chapter 1	General components of soil Master horizons
Physical Properties Chapter 4	Color Texture definitions Mechanical analysis Feel method Importance of texture Structure definitions Importance of structure Management effects on structure Density and porosity Effects of porosity on air and water movement Management effects on porosity
Pedogenesis Chapter 2	Rock weathering processes Four processes of soil formation Five factors of soil formation Types of parent material Effects of climate on soil formation Effects of living organisms Effects of relief Effects of time Major subordinate horizons
Soil Classification Chapter 3	Hierarchy in Soil Taxonomy Diagnostic horizons Twelve soil orders
Soil Survey Chapter 19	Use of information in soil surveys
Soil Water Chapter 5	Capillarity and capillary rise Soil water energy and potential Soil moisture characteristic curve Soil water movement Hydraulic conductivity Effects of layering on movement Physical and biological definitions Factors affecting available water
Field Hydrologic Cycle Chapter 6	Processes in the field water cycle Water conservation management Drainage Irrigation
Soil Air and Temperature Chapter 7	Composition of soil air Importance of aeration Redox potential Management of soil aeration Wetlands and hydric soils Factors affecting soil temperature Daily and seasonal variations Management of soil temperature
Soil Chemistry Chapter 8	General types of soil colloids Structure and properties of layer aluminosilicates Types of charge Cation exchange and CEC Anion exchange and AEC
pH Management Chapter 9	Definition of pH Importance of pH Sources of H^+ and OH^- Definitions of acidity pH buffering Use of lime and sulfur
Salinity Chapter 10	Effect of salinity on plant growth Saline, sodic and saline sodic soils Reclamation strategies
Soil Biology Chapter 11	Relative numbers and biomass Soil fauna Roots Soil microflora
Organic Matter Chapter 12	C cycle Greenhouse effect Decomposition rates of residues Mineralization and immobilization
	Factors affecting decomposition Composition of humus Importance of organic matter Composts
Nitrogen and Sulfur Fertility Chapter 13	N mineralization and immobilization Ammonium fixation Ammonia volatilization Nitrification Nitrate leaching Denitrification Biological N fixation Oxidation / reduction reactions Environmental problems associated with S oxidation
Phosphorus and Potassium Fertility Chapter 14	P fertility limitations Eutrophication Fixation reactions of inorganic P Factors affecting fixation Importance of K to plants Sources and relative availability of K Luxury consumption K fixation
Micro-nutrients Chapter 15	Deficiencies and toxicities Effects of pH and redox potential on availability of certain micronutrients Chelated forms
Nutrient Management Chapter 16	Best management practices Organic fertilizers Inorganic fertilizers Concept of the limiting factor Plant analysis Soil analysis Fertilizer application methods Economic considerations
Chemical Pollution Chapter 18	Fate of synthetic organic contaminants in the soil environment Sources of inorganic contaminants Fate of inorganic contaminants Bioremediation strategies
Erosion Chapter 17	Accelerated erosion Costs of erosion Mechanics of water erosion Types water erosion USLE and its components Mechanics of wind erosion Types of wind erosion WEQ and its components