

# SOIL SCIENCE

## Spring 2015 Syllabus AGRI 2051 Section 001X

Lecture 11:00 – 12:15 and 1:00 – 2:15 Thursdays  
206 Science Building

Instructor     Lewis Gaston  
Office         224 Madison B. Sturgis Hall, LSU, Baton Rouge, La. 70803  
Lab             232 Madison B. Sturgis Hall  
Phone         225 578 1323  
Cell            225 892 0198  
e-mail         [lagaston@agctr.lsu.edu](mailto:lagaston@agctr.lsu.edu)  
Hours          Thursdays when on campus

### Course Description

Prerequisite: CHEM 1202 and 1302. Corequisite: AGRI 2061. Principles of soil science. Properties of soils related to plant growth and the environment.

### Course Objectives

Students will know and understand:

1. General components of soil and master soil horizons.
2. Basis for assigning color and its biological and/or chemical significance; definition of texture, how it is measured (mechanical analysis and feel method), and its importance in crop production and to the environment; types of structure, how management affects it and its importance; definitions of density and porosity, how to measure these parameters, effects of management on them and their importance.
3. That the chemical and physical weathering of rock yields particulate geologic materials that are altered in composition and disposition by the four processes of soil formation, which, in turn are controlled by the five factors of soil formation --parent material, climate, living organisms, relief, and time; major subordinate horizons.
4. Classification of soil by the USDA system, Soil Taxonomy, including hierarchy of the system, types of diagnostic horizons, and pedogenesis underlying the first hierarchical level, the 12 soil orders.
5. Information in hardcopy and web-based soil surveys and how to use this information.
6. Concepts of soil water capillarity; components of soil water potential energy; moisture characteristic curve; soil water movement based on gravitational and matric-pressure potential, including the effect of hydraulic conductivity; effects of soil horizonation on water flow; traditional physical and biological definitions of soil water based on the moisture characteristic curve; chemical and physical factors affecting the shape of the moisture characteristic curve, thus amount of plant-available water.
7. Processes in the field hydrologic cycle; water conservation and use management, including aspects of drainage and irrigation engineering.
8. Composition of soil air, importance of soil aeration, use of redox potential to measure aeration level, and management of soil aeration; definitions and environmental importance of wetlands and hydric soils.

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9. Factors affecting soil temperature, and daily and annual cycles of temperature.
10. General types of soil colloids, the structure and properties of layer aluminosilicates, including types of charge, the phenomena and basis of ion exchange, soil-specific capacities for cation and anion exchange (CEC and AEC), and importance of these chemical reactions.
11. Definition of pH, its importance, sources of  $H^+$  and  $OH^-$ , pH buffering in soils, and how it is managed with base (e.g., lime) or acid (e.g., sulfur) amendments.
12. Effect of salinity on plant growth, definitions of saline, sodic and saline sodic soils, and reclamation strategies for soil with high salt or sodium content.
13. Relative numbers and biomasses of soil micro-flora and -fauna; rhizosphere effects on soil biology; types and importance of mycorrhizal fungi; important biochemical processes mediated by soil microfauna.
14. Carbon cycle and how alterations to it contribute to global climate change; decomposition rates of organic residues, including concepts of mineralization and immobilization, and factors affecting organic matter decomposition; composition of humus; importance of organic matter to crop production and environmental quality; composts and composting.
15. Nitrogen cycle, including mineralization and immobilization, ammonium fixation, ammonia volatilization, nitrification, nitrate leaching, denitrification, and biological N fixation; S cycle, including oxidation / reduction reactions, and environmental problems.
16. Phosphorus fertility limitations and the contrary problem of water quality degradation by P-induced eutrophication; fixation reactions of inorganic P, including factors affecting fixation; Importance of K to plants, sources of it and their relative plant-availability, excessive (luxury) uptake of K.
17. Micronutrient deficiencies and toxicities, including effects of pH and redox potential on micronutrient availability; micronutrient fertilization, including salt and chelated forms.
18. Nutrient best management practices; types and uses of organic and inorganic fertilizers; Liebig concept of the limiting factor; nutrient management, including plant and soil analyses; fertilizer application methods; economic considerations.
19. Fate of organic and inorganic contaminants in the soil environment; sources of inorganic contaminants; remediation strategies, including bioremediation.
20. Accelerated water erosion, including environmental effects and economic costs; mechanics of water erosion, including types and use of USLE and related models in water erosion control; mechanics of wind erosion, including environmental and economic costs; mechanics of wind erosion, including types and use of WEQ and related models in wind erosion control.

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## Attendance

Inasmuch as enrollment makes this course more seminar than traditional lecture, attendance and participation likely means greater insight and understanding than opting for independent study of text, web or other materials.

## Methods of Evaluation

Performance in the course will be evaluated using written examinations and quizzes. Also see Topical Outline.

Exams            There will be four mid-semester examinations, with the lowest dropped, and a final examination.  
Quizzes         There will be eight quizzes, with the lowest two dropped.

## Make-up Policy

There will be one (1) make-up exam (for mid-semester exam 1, 2, 3 or 4, as needed per student) and it will be on the last day of class. There will be no make-up quizzes.

## Determination of Final Grade

<i>Point Percentage</i>	<i>Grade</i>	<i>Components</i>	<i>Total Points</i>
90	A	Highest 6 of Quizzes 1 – 8	150
80	B	Highest 3 of Exams 1 – 4	600
70	C	Exam 5	<u>250</u>
60	D	Sum	1000
Below	F		

## Drop Dates

Last day to drop course without a W            January 30  
Last day to drop with a W                         March 24

## Course Materials

Text            The Nature and Properties of Soils, 11<sup>th</sup>, 12<sup>th</sup>, 13<sup>th</sup> or 14<sup>th</sup> Edition N.C. Brady and R.R. Weil  
  
Other            <http://www.agronomy.lsu.edu/courses/agro2051/index.htm>  
                    Site has synopses of chapters, annotated presentations, reviews and other pertinent matter.

## Students with Disabilities

Students who provide appropriate written documentation of a learning, physical, or psychological disability may be eligible for academic accommodations after assessment by LSUA's licensed professional counselor. To make an appointment to see the counselor, students should visit Student Support's administrative office, Room 206, Student Center West Wing or call (318) 767-2604.

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### Topical Outline

Date	AM Session	PM Session
J 15	Introduction (Chapter 1)	Physical Properties (Chapter 4)
J 22	Physical Properties <b>Quiz 1</b> –Physical Properties	Soil Formation (Chapter 2)
J 29	Soil Formation Classification (Chapter 3)	Classification
F 05	Soil Survey (Chapter 19) <b>Quiz 2</b> –Formation / Classification	Soil Water (Chapter 5)
F 12	<b>EXAM 1</b> –Chapters 1, 2, 3, 4 and 19	Soil Water Hydrologic Cycle (Chapter 6)
F 19	Hydrologic Cycle Soil Air and Temperature (Chapter 7)	Soil Air and Temperature <b>Quiz 3</b> –Soil Water / Hydrologic Cycle
F 26	<b>EXAM 2</b> –Chapters 5, 6 and 7	Colloids (Chapter 8)
M 05	Colloids Soil pH and Management (Chapter 9)	pH and Management <b>Quiz 4</b> –Colloids / pH Management
M 12	Salinity and Sodicity (Chapter 10)	Soil Biology (Chapter 11)
M 19	<b>EXAM 3</b> –Chapters 8, 9, 10 and 11	Organic Matter (Chapter 12)
M 26	Organic Matter Macronutrients (Chapters 13 and 14)	Macronutrients <b>Quiz 5</b> –Organic Matter
A 02	Spring Break	Spring Break
A 09	Macronutrients	Micronutrients (Chapter 15) <b>Quiz 6</b> --Macronutrients
A 16	<b>EXAM 4</b> –Chapters 12, 13, 14 and 15	Nutrient Management (Chapter 16)
A 23	Nutrient Management Soil Pollution (Chapter 18)	Soil Pollution <b>Quiz 7</b> –Nutrient Management
A 30	Erosion (Chapter 17) <b>Quiz 8</b> --Pollution	Make-up Exam
M 07	<b>EXAM 5</b> –Chapters 16, 17 and 18, and All Previous 10:15 – 12:15	

### Code of Student Conduct

See <http://chancellor.lsua.edu/docs/default-source/Policies/policystatement228.pdf?sfvrsn=4>

All therein must be strictly followed.