

# Geo352: Introduction to Soil Science - Understanding Environmental Issues

(Graduate students are able to enroll for this course under Geo534 -  
for more info contact the instructor by email)



Past field trip with John Whitney, USDA-NRCS Erie County

*"For in the end we will conserve only what we love. We will love only what we understand. And we will understand only what we are taught."* -

*Baba Dioum, Senegalese Conservationist, Scholar and Statesman, in a Speech at the General Assembly of the International Union for the Conservation of Nature held in New Delhi, India (1968)*

**Instructor:** Chris S. Renschler ([rensch@buffalo.edu](mailto:rensch@buffalo.edu))

**Teaching Assistance:** no TA this semester

**Class Time (Fall '19):** Tuesdays and Thursdays 2:00-3:20 pm (initially 355 Fillmore)

**Office Hours (Fall '19):** Tuesdays 11 am-Noon and Thursdays 1-2 pm (116 Wilkeson)

**Audience:** Undergraduate Students in Geography, Geology, Civil Engineering, Planning or Environmental Studies, Physics, Chemistry, Biology, or permission by instructor.

**Goals & Objectives:** This interdisciplinary course introduces students to soil science. The emphasis in the course is to learn the most important soil properties and processes, such as soil-forming processes, composition and classification of soils, and the spatial distribution of major soil categories. The most relevant analysis methods for soil properties, soil/plant relationships, nutrients, land management practices, and ecological problems are discussed. The interdisciplinary nature of this course allows students to understand key properties and processes not only in soils, but in the environment in general - **a must for everybody interested in understanding environmental issues.**

**Required Textbook:** Nyle C. Brady and Ray R. Weil, 2004: **Elements of the Nature and Properties of Soils**. Second Edition. Pearson/Prentice Hall (ISBN 0-13-048038-X; 3rd edition is also acceptable ISBN 0135014336). Companion webpage (go to each chapter for Quizzes, Web Links, and Color Photos) Other helpful sources for information are at Ten Key Messages, Careers in Soils, and other Soil Facts provided by the Natural Resource Conservation Service (NRCS).

**The course includes the following topics** in preparation for the three exams (reading these before the class is highly recommended):

- The Soils Around Us (p.1-25).
- Formation of Soils from Parent Materials (p.26-57).
- Soil Classification (p.58-93).
- Soil Architecture and Physical Properties (p.94-133).
- Soil Water: Characteristics and Behavior (p.134-161).
  
- Soil and the Hydrologic Cycle (p.162-199).
- Soil Aeration and Temperature (p. 201-233).
- The Colloidal Fraction: Seat of Soil Chemical & Physical Activity (p. 235-265).
- Soil Acidity, Alkalinity, and Salinity (p. 266-315).
- Organisms and Ecology of the Soil (p. 316-351).
  
- Soil Organic Matter (p. 353-385).
- Nitrogen and Sulfur Economy of Soils (p. 386-420).
- Soil Phosphorus, Potassium, and Micronutrients (p. 422-470).
- Practical Nutrient Management (p. 472-514).
- Soil Erosion and Its Control (p. 516-556).

**Schedule:** The official course webpage is only accessible through UBlerns - enrolled students must check on UBlerns for the latest updates in schedule and syllabus. **Please note that the schedule of chapters and activities may change.**

**Index:** Lecture (Chapter number), **Lab Activity (Assignment number)**, Review Session (last session before an exam) and **Exam (questions to these chapters)**.

Week	Dates	Tuesday	Thursday
1	Aug 27/29	Introduction & Syllabus	The Soils Around Us (Ch. 1)
2	Sep 3/5	Formation of Soils from Parent Materials (Ch. 2)	Soil Classification (Ch. 3)
3	Sep 10/12	<b>Digital Soil Maps (Take Home - Assignment 1)</b>	Soil Architecture and Physical Properties (Ch. 4)
4	Sep 17/19	Soil Water: Characteristics and Behavior (Ch. 5)	Soil and the Hydrologic Cycle (Ch. 6)
5	Sep 24/26	Review Session	<b>Exam 1 (Ch. 1-5)</b>
6	Oct 1/3	<b>Field Trip - Soils on Campus with NRCS Representatives (Take Notes - Assignment 2)</b>	Guest Speaker: Chi Ho Sham, Ph.D. (VP & Chief Scientist, Eastern Research Group): USDA Natural Resources Conservation Service funding under the 2018 Agriculture Improvement Act for source water protection. Soil Aeration and Temperature (Ch. 7) Or <b>Field Trip (if weather permits Sep 27)</b>
7	Oct 8/10	The Colloidal Fraction: Seat of Soil Chemical and Physical Activity (Ch. 8)	Soil Acidity (Ch. 9 - Part I)
8	Oct 15/17	Soil Alkalinity and Salinity (Ch. 9 - Part II)	Organisms and Ecology of the Soil (Ch. 10)
9	Oct 22/24	Review Session	<b>Exam 2 (Ch. 6-10)</b>
10	Oct 29/31	Soil Organic Matter (Ch. 11)	Nitrogen & Sulfur Economy (Ch. 12)
11	Nov 5/7	Soil Phosphorus and Potassium (Ch. 13 - Part I)	Soil Micronutrients (Ch. 13 - Part II)
12	Nov 12/14	Practical Nutrient Management (Ch. 14)	Soil Erosion and Its Control (Ch. 15)
13	Nov 19/21	NRCS Soil Health Videos (Part 1)	NRCS Soil Health Videos (Part 2)
14	Nov 26/28	<b>On-line Lecture &amp; Computer Lab - WEPP/GeoWEPP (Take Home - Assignment 3)</b>	No classes - Thanksgiving/Fall Recess
15	Dec 3/5	Review Session + Course Evaluation	<b>Exam 3 (Ch. 11-15)</b>

### Student Learning Outcomes:

Course Learning Outcome	Program Outcomes/Competencies	Instructional Methods	Assessment Methods
Provide breadth of knowledge of basic principles and concepts	Understand basic concepts of soil sciences	Lecture	Exams 1
Provide depth within specialized areas	Understand investigates the complexity and interaction of physical, chemical and biological processes in the soil	Lecture and feedback through participation	Exam 1 to 3; Participation
Provide an understanding of experimental design and methodology / Develop approaches for integration of information	Understand illustrate examples in lecture and assignments; Demonstrate knowledge through exams and group individual assignments	Lecture; Lab assignments	Exam 1 to 3; Assignment 1 to 3
Encourage critical thinking and hypothesis building / Provide skills in writing and communication / Provide contemporary information / Encourage appreciation of scientific values	Discuss current issues and applications through participation	Lecture and discussion through participation	Participation

**Activities:** Students are evaluated [% of total grade] based on their performance in

- [75%] Three Exams (25% each),
- [24%] Three Activity Reports on Assignments (1 page maximum; all assignments are due through Ublearns before class exactly 1 week after the activity took place; past due delivery will result in a 1-point penalty per day; that means no submission will be accepted 8 days past the due date!),
- [1%+] Extra Credit Points (1 point = 1 % added to the total score at the end of the semester): Extra Credit Points can be gained by active participation and correct answering questions during the class, especially in the interactive review sessions before exams. Reading chapters before class will help you to actively participate and prepare yourself for the exams).

**Exams:** There are **three exams with 50 multiple-choice and 16 true-false questions** (total points per exam: 22; time limit: 80 minutes). There is no final exam.

**Make-up exams** will be only given where a student contacts me before or at the day of the scheduled test and offers an acceptable excuse. Make-up exams must be taken no more than 7 days after the scheduled exam date (usually during my office hours), except where prolonged illness prevents this. In case of an illness or accident a medical certificate from either a doctor or health service will be required. The instructor reserves the right to alter the course schedule and format of the exams as is deemed necessary.

**Assigned activity reports** (three assigned tasks; total points per report: 8) have to be submitted through Ublearns before the first class in the week following the activity. Failure to submit in time will result in a point reduction of 10% per day.

The **final letter grades** are A (90-100%), A- (85-89%), B+ (80-84%), B (75-79 %), B- (70-74%), C+ (65-

69%), C (60-64%), C- (56.6-60%), D+ (53.3-56.6%), D (50-53.3%), and F (0-50%).

For incomplete work, academic integrity, and disability services refer to the University undergraduate Incomplete Policy, Integrity Policy, and the University's Disability Service Office (you must register with the office to receive accommodation for physical and learning disabilities), respectively.