Syllabus for SOIL, CHEM, or GEOL 424/SOIL 479:

Environmental Soil Chemistry

New Mexico State University | Department of Plant & Environmental Sciences | Spring 2022

Help Clean up the Environment and Feed the World

Soil Chemistry is the study of the composition, properties, and chemical reactions of soils. Many of the same chemical principles that apply to remediating soil and water also pertain to efficient fertilizer use and optimizing crop growth. This SOIL course is cross-listed with CHEM and GEOL which illustrates the interdisciplinary nature and applicability of the subject.

The learning objectives of this class are to describe and explain

- ✓ the solid and liquid phases of soil;
- ✓ the chemical reactions and processes that occur between various soil phases;
- ✓ how soil chemistry processes can be managed to promote plant productivity and land remediation, including the techniques and calculations used.

How to Earn a Good Grade…

Grades are based on ~weekly assignments (70%), one Mid-term (10%), Final Exam (10%), and Canvas or in-class quizzes & exercises (10%). Homework grades will be reduced by 10% per week if late. Students enrolled in 479 will present in-class demonstrations and they will have more in-depth problem sets than 424 students. Letter grades will be assigned according to the following:

90-100% = **A**; 80-89.9% = **B**; 70-79.9% = **C**; 60-69.9% = **D**

…attend class, do the homework, read the book and papers…

Please be considerate of others, put away your cell phones when in class, and keep unrelated conversations between individuals to a minimum. We are planning on meeting in person unless directed otherwise. If we go virtual, you must have access to Canvas, internet, and a computer (*cell phones are insufficient for viewing course material)*. In-person lectures will not be recorded, but annotated slides and other helpful materials will be posted on Canvas soon after class.

Grade disputes: Except for a point tally error, which should be reported immediately, if you have a disagreement with the key or with the amount of partial credit you receive on a problem or assignment, **plead your case in writing** and submit for a response **within one week** of the return of your exam or assignment. Include a copy of the original problem(s) or assignment in question.

PREREQUISITE:

Either *more than* two semesters of Chemistry or SOIL 2110 and L (*formerly SOIL 252**)

**Not having had Introductory Soils will be a disadvantage in this class; to gain a better understanding supplement your reading with a comprehensive soil science textbook (i.e., Brady and Weil ≥9th ed - available in the library)~*

Instructor: **April L. Ulery, Ph.D.**
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Email: aulery@nmsu.edu
Office: Skeen Hall N340
Hours: T 2-4 pm or
by appointment.
Zoom preferred.

Basic Course Concepts

I. Overview of Soil Chemistry (1 wk)
   A. Environmental Chemistry
   B. Chemistry applied to soil
   C. Math and units applied to soil

II. Description of Soil Components (3-4 wk)
   A. Inorganic Solids and Soil Mineralogy
   B. Soil Organic Matter
   C. Soil Solution

III. Processes and Properties in Soils (1-2 wk ea)
   A. Chemical Weathering/Salinity
   B. Acidity and pH
   C. Ion Exchange
      - CEC and AEC
      - constant and variable charge
   D. Sorption
      - Inner sphere and outer sphere complexes
      - Sorption isotherms
      - K_{oc}, K_d, and partition coefficients
   E. Redox Chemistry

Textbooks (*Recommended):

***Essington, M.E. 2015. *Soil and Water Chemistry, An Integrative Approach*. 2nd ed. CRC Press. Boca Raton.**

***Hites, R.A. & J.D. Raff. 2012 or 2020. Elements of Environmental Chemistry. 2nd or 3rd ed. Wiley. Hoboken, NJ.**

Sparks, D.L. 2003. *Environmental Soil Chemistry2nd Ed.*, Academic Press, San Diego, CA

Bohn, McNeal, O'Connor. 1985 or 2001. *Soil Chemistry 2nd or 3rd Ed.*, Wiley & Sons, New York, NY.

Evangelou, V.P., 1998. *Environmental Soil and Water Chemistry*, Wiley & Sons, New York, NY.

McBride, M.B. 1994. Environmental Chemistry of Soils. Oxford Univ. Press. New York, NY.

Grades, lecture slides, internet links, articles, practice exams, etc. will be posted on **Canvas**. If you have problems accessing Canvas, contact https://learning.nmsu.edu/canvas-faq-for-students/ If you want hardcopies let Dr. Ulery know.

Class meets in person

M & W in Skeen 129
12:00 – 1:15 pm

Holidays:
Mon., Jan. 17
M - F Mar 7 - 11

Last day to *add* class:
M., Jan. 24

Last day to *withdraw* from class:
R., Mar. 17

Final Exam:
Wed., May 4 at 10:30-12:30 pm

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act Amendments Act covers issues relating to disability and accommodations. If a student has questions or needs an accommodation in the classroom (all medical information is treated confidentially), contact Aaron Salas, Director Student Accessibility Services in Corbett Center, Room 208
Phone: 575-646-6840 see http://sas.nmsu.edu/

NMSU policy prohibits discrimination on the basis of age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, retaliation, serious medical condition, sex, sexual orientation, spousal affiliation and protected veterans status. Furthermore, Title IX prohibits sex discrimination to include sexual misconduct: sexual violence, (sexual assault, rape), sexual harassment and retaliation. For more information on discrimination issues, Title IX, Campus SaVE Act, NMSU Policy Chapter 3.25, NMSU's complaint process, or to file a complaint, see http://eeo.nmsu.edu/ or E-mail: equity@nmsu.edu

Bring a **scientific calculator** to class (**no cell phones** on quizzes or exams). The Student Code of Conduct defines academic misconduct, non-academic misconduct and the consequences or penalties for each. See the NMSU Student Handbook at: http://studenthandbook.nmsu.edu/ Academic misconduct is explained here: http://studenthandbook.nmsu.edu/student-code-of-conduct/academic-misconduct/ You can see all of the policies including required COVID practices at: https://provost.nmsu.edu/faculty-and-staff-resources/syllabus/policies.html

Cheating and plagiarism will not be tolerated; you are expected to do your own homework.