

SWS 6454
Advanced Soil and Water Chemistry

Instructor: Dr. Jonathan Judy, Assistant Professor, Soil and Water Sciences Dept.

Office location: 2167 McCarty Hall A

Office hours: Please call or email for an appointment.

Course Prerequisites: SWS 4451/5406; General Chemistry (CHEM 2046 or equivalent).

Credit Hours: 3 credits

Delivery Method: Classroom, Spring semester every odd year

Enrollment Cap: 10

Class meetings: Thursdays, periods 4 and 5 (12:50 PM - 3:50 PM) in McCarty Hall A, room 3177

Course Overview:

The course will expand on concepts presented in SWS 4451/5406, as well as introducing more complex material not covered in SWS 4451/5406. This course will also feature a significant focus on laboratory methods and skill development.

Course Objectives:

In this course, we will describe the soil solid and solution phases, introduce the chemical principles necessary to examine the soil environment, and identify the chemical processes that occur in the soil environment and ultimately impact the fate and behavior of substances in soil and other natural water systems.

After finishing this class, you will be able to:

1. Approach laboratory tasks related to soil characterization, including soil fractionation, X-ray diffractometry, organic matter determination and cation-exchange capacity measurement.
2. Understand different soil extraction methods, including understanding which methods are ideal for specific purposes and interpreting data.
3. Approach the operation of classic soil chemistry instrumentation, including atomic absorption spectrometers, ICP-MS/OES, UV-VIS spectrophotometers and zetasizers.
4. Execute strong-acid digestion of soils and plant materials for elemental analysis safely and understand different variations of these methods and the reasons to use different variations.
5. Have an improved understanding of thermodynamics, chemical equilibria and surface chemistry in soils.

Course Requirements: Students must have an e-mail account, Internet access and access to a computer that meets the [University of Florida computer standards](#).

Required Texts:

1. Soil and Water Chemistry: An integrative approach. M. Essington. 2015. 2nd edition, CRC Press
2. Soil Physical Chemistry. D. Sparks. 1999. 2nd edition. CRC Press

Course Web Site: Lectures, handouts and assignments are posted on the class website on Canvas. Go to <http://elearning.ufl.edu/>, log on using your Gatorlink. You need to have a Gatorlink account <http://www.gatorlink.ufl.edu/> to be able to log on to the class. Please note that E-learning needs Java to work properly. You can download Java from the same website.

Students Responsibilities

Students are expected to study the assigned text sections and listen to narrated lectures prior to lecture coverage in class. Students are expected to actively participate in class chat discussions.

HW, Class Discussions and Exams:

This class has required HW, discussion posts, lab reports, a class project, a presentation summarizing knowledge gained about a personal sample and written/practical exams. Your final grade will be based on the cumulative score for these assignments.

Course grades are determined by summing all scores, dividing by the maximum score possible and multiplying by 100: 100-92% = A, 91-90% = A-, 89-87% = B+, 86-82% = B, 81-79% = B-, 78-75% = C+, 74-70% = C, 69-65% = D+, 64-60% = D, <59% = E. See also UF policies at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

Make-Up Work and Absences

Make up exams are rarely authorized and must be medically justified and authenticated.

Homework assignments will be assigned regularly and will be graded. A *10% per day* lateness deduction will be assessed for any assignments (not just homework) turned in late. Work more than a week late *will not be accepted*.

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Online Course Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.* You are expected to exhibit

behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see:

<http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php>.

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Services for Students with Disabilities:

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation
0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Campus Helping Resources:

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

1. *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575,*
www.counseling.ufl.edu/cwc/

- Counseling Services
- Groups and Workshops
- Outreach and Consultation
- Self-Help Library
- Training Programs

Community Provider Database

2. U Matter We Care, www.umatter.ufl.edu/
3. Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/

Student Complaints:

Each online distance learning program has a process for, and will make every attempt to resolve, student complaints within its academic and administrative departments at the program level. See <http://distance.ufl.edu/student-complaint-process/> for more details.

The schedule below is tentative and is subject to change.

Week (s)	Lecture Topics	Lab Topics	Readings	Assessments (Check due dates on Canvas)
1, 1/10/18	SSSA/No class	Select personal Soil Sample; Air dry and sieve to < 2 mm;	Essington Chapter 2.1-2.6	Personal Sample Canvas Discussion Post
2, 1/17/18	Thermodynamics applied to Soil, 1	Soil Fractionation and Characterization	Essington Chapter 12.1-12.2 Sparks Chapter 3, Sections II, III, VI	
3, 1/24/18	X-ray diffractometry and clay mineralogy	X-ray Diffractometry	Essington Chapter 2.7, 12.1-12.2, Sparks Chapter 3, Sections II, III, VI, Harris , XRD techniques PDF	Thermo HW Due
4, 1/31/18	Thermodynamics applied to Soil, 2	X-ray Diffractometry	Essington Chapter 5.1-5.10	Soil fractionation Report Due
5, 2/7/18	Soil extractions	Operationally-defined soil extractions	Essington Chapter 5.11	XRD Report Due
6, 2/14/18	Acid digestion/Midterm review	Open and closed-vessel strong-acid digestions	EPA Methods 3050B, 3052, SRM certificate	Extractions Report Due
7, 2/21/18	Midterm Exam/Lab Practical			Midterm Exam/Lab Practical
8, 2/28/18	Adsorption Isotherms	Phosphorus adsorption and UV-VIS Spectrophotometer	Selected EPA methods and manuscripts	Digestions Report Due
9,	Spring Break/No class			

3/7/18				
10, 3/14/18	AA and ICP	Atomic Absorption Spectrophotometry/ICP	Selected EPA methods and manuscripts	Metals Analysis Report Due
11, 3/1/18	Surface Chemistry, 1	Specific surface area	Essington Chapter 8	AA and ICP Report Due
12, 3/28/18	Surface Chemistry, 2	Zeta potential/electrophoretic mobility and point of zero charge	Essington Chapter 9	Surface Chemistry HW Due
13, 4/4/18	Oxidation-reduction reactions		Essington Chapter 7	Zetasizer HW due
14, 4/11/18	Personal Sample Presentations			Redox HW Due
15, 4/18/18	Review for final exam			
16	Final Exam/Practical			Final Exam/ Practical