

Soil Chemistry

GES 166/266
Winter 2004

COURSE SYLLABUS

Course Instructor: Scott Fendorf
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Teaching Assistants: Ben Kocar
325 Green; 3-4152 kocar@pangea
Jim Neiss
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Meeting Times:

Lecture: 9 – 10:15 pm Tuesday, Thursday
Recitation: 2:15 –3:30 pm Thursdays

Location:

131 Green or A25 Mitchell

Course Website

The URL for the course website is “<http://soils.stanford.edu/classes/GES166.htm>”. In addition to the syllabus and schedule, we will post all homework assignments, lecture supplements, and other misc. material electronically. Please check the site regularly.

Course Objectives:

- *To define the chemical composition of soil materials*
- *To comprehend the chemical (and biochemical) factors functioning within soil systems*
- *To define the chemical factors influencing the fate of elements (contaminant and nutrient) within soils*

Recommended Text and Reading Assignments:

Environmental Chemistry of Soils by Murray B. McBride, 1st Edition, Oxford Press.

In additions to the readings from *Environmental Chemistry of Soils*, I will provide handouts over the duration of the quarter that will provide supplementary information. Additionally, we will have at least one (and two or more on occasion) manuscript(s) to read for the recitation period; afternoon lectures will be given on the specific subject of these readings.

Grading and Exams:

Exams: There will be one in-class exam during the quarter (a midterm exam) and the final will consist of a take-home exercise. The midterm exam will be one hour in length (nominally) and worth 100 pts. The take-home exercise will be given out on the last day of class (March 11) and will be due by 5 pm on the following Tuesday.

Grading: Grading in the course will be based on the exam, final exercise, regular homework assignments, and your participation and effort in this class.

Points and grading will be as follows:

Exam (mid-term)	100
Final	100
Homework	100
Participation & Effort	75
<u>Lectures (266 credit only)</u>	<u>50</u>
Total (166 credit)	375
Total (266 credit)	425

My grading formula for the course is complex; I take into consideration the total points accumulated, exam trends (i.e., whether scores increased or decreased through the course), and the effort correlated with the score received. Many people insist on knowing the points needed for a specific grade, so I will guarantee at least the following for 166 credit: ≥ 335 points = A; 334-300 = B; 299-265 = C

Participation:

Everyone is expected to attend, and most importantly, interact within the lecture and absolutely during the recitation. We hope to develop a ‘dynamic’ class environment through such interactions.

Philosophy:

Please feel free to ask questions at any time during the lectures. The questions, however, should be directed at me and not at your neighbor. I am tolerant of many things but talking in class is **not** one of them; this not only disrupts my lectures but can disturb those around you who are try to focus on the lecture. I am always available during the afternoons for questions as well. If you have any constructive advise during the semester I would greatly appreciate your input. You can either see me or leave a note in the envelop outside my office.

Recitation:

In addition to the morning lectures, we will also have a one-hour session on Thursday afternoons devoted to papers dealing with specific topics. Student lectures will be given by individuals seeking graduate credit (GES 266) on assigned readings; we will then follow the lectures with a discussion on the topic (specific to general). Everyone (166 AND 266) is expected to participate in the discussion! To ensure a lively discussion, we will have a question-set on the reading that will be due at the beginning of each afternoon lecture. Late responses are NOT acceptable.

Graduate (266) Credit

To receive graduate (266) credit for the class, you must give one lecture on an assigned paper during the recitation. Additionally, you will be responsible for developing a discussion questionnaire for the specific topic. Further details are provided on the “Recitation Reading and Graduate Credit” handout.

SCHEDULE (tentatively)

Date	Lecture Topic	Text
1/6	Course Introduction and Soil Chemical Concepts	Ch. 1
1/8	SOLID PHASE Soil Minerals - Phyllosilicates	Ch. 2, Handout
1/13	- Accessory minerals	
1/15	- X-ray diffraction Soil Organic Matter	
1/20	SOIL SOLUTION - Ion Activities - Hydration Reactions	Handout, p. 7-21
1/22	- Acid/Base Properties and Buffering - Complex Equilibria • Carbonate System	
1/27	SOLID-WATER INTERFACE - Types of Ion Retention - Ion Exchange - Salt Affected Soils	Handout Ch. 3 Ch. 8 (select)
1/29	- Description of Surfaces - Zero Points of Charge	
2/3	- Ion Retention - Cations - Anions	Ch. 4
2/5		
2/10	EXAM 1	
2/12	- Precipitation/Dissolution	p. 154-164 p. 218- 237 Handout
2/17	- Mineral Stabilities and Transformations	
2/19	ACID SOILS	Ch. 5
2/24	REDOX REACTIONS and BIOGEOCHEMISTRY	Ch. 7
2/26		
3/2		
3/4	TRACE ELEMENT CYCLES	Ch. 9
3/9		
3/11	Summary	