Environmental Soil (Geo)chemistry  
26:380:561:01

Instructor: Dr. Evert J. Elzinga; Office: Room 139 Smith Hall; Email: elzinga@andromeda.rutgers.edu  
TelephoneNumber: 973 353 5238  
Lecture: Tuesday 6-9 pm  
Location: 127 Smith Hall  
Office hours: open door  
Prerequisites: General Chemistry, (Geochemistry)

Course description  
The course introduces students to the main chemical processes occurring in soils that determine the  
 mobility and solubility of major and minor elements (including pollutants) in soil environments.  
 Emphasis is placed on quantitative description of occurring reactions and associated impacts on pore  
 and groundwater composition. The course trains students in applying common chemical speciation  
 models (e.g. Visual Minteq) to predict chemical behavior.

Course objectives:  
Upon completion of the course, students are expected to:  
(1) be familiar with the soil components and properties responsible for the chemical reactivity of soils  
(2) have a qualitative and quantitative comprehension of the major chemical chemical processes in soils  
(3) be able to use chemical speciation models to describe and predict chemical speciation and processes  
(4) be able to link theoretical soil chemistry concepts to real-world environmental issues.

Study Materials:  
2. Lecture notes (pdf files of lecture slides will be provided)  
3. Handouts

Other textbooks of interest (not required):  
The Chemistry of Soils, Garrison Sposito, Oxford University Press, 1989

Homework, Exams and Grading:  
There will be a total of 5 (five) homework sets during the course. In addition, there will be a midterm  
and a final exam. The midterm exam will be take-home, and the final will be in-class in the last week  
of the semester. The homework and exam scores will be weighed as follows to determine the final  
grade:

Homework (5 sets, 6% each): 30%  
Midterm: 35%  
Final: 35%

Exams: Although exams are not cumulative, be aware that the subjects covered build upon themselves  
so that you need to know the earlier material in order to understand the material covered later in the
class. There will be no make-up exams, except in cases where arrangements were made before the exam is given.

Homework: Homework assignments will be given based on topics discussed in class. Homework sets will be handed out at the end of the lecture (see dates indicated in the schedule) and will be due at the start of the next lecture.

Grading Formula: Specific grades are as follows: $\geq 90.0\% = A$; $89.9-80.0\% = B$; $79.9-70.0\% = C$.

Class Schedule*:

<table>
<thead>
<tr>
<th>Date</th>
<th>Subject</th>
<th>Study Material</th>
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</thead>
<tbody>
<tr>
<td>01/18/11</td>
<td>Introduction; Chemical review</td>
<td>Sparks Chapter 1, p.1-28</td>
<td>HW1</td>
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<tr>
<td>01/25/11</td>
<td>Inorganic Soil Components</td>
<td>Sparks Chapter 2</td>
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<tr>
<td>02/01/11</td>
<td>Soil Organic Matter</td>
<td>Sparks Chapter 3 (skip p.101-109)</td>
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<tr>
<td>02/08/11</td>
<td>Soil Solution Phase</td>
<td>Sparks p.101-109, and p. 101-126</td>
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<tr>
<td>02/15/11</td>
<td>Sorption</td>
<td>Sparks p.127-185</td>
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<tr>
<td>02/22/11</td>
<td>Sorption</td>
<td>Sparks p.127-185</td>
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<tr>
<td>03/01/11</td>
<td>Kinetics</td>
<td>Sparks Chapter 7</td>
<td>HW3</td>
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<tr>
<td>03/08/11</td>
<td>Soil Redox chemistry</td>
<td>Sparks Chapter 8 &amp; Handouts</td>
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<tr>
<td>03/15/11</td>
<td>Spring Break</td>
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<tr>
<td>03/22/11</td>
<td>Midterm Exam</td>
<td>Lectures 1through 7</td>
<td>HW4</td>
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<tr>
<td>03/29/11</td>
<td>Soil colloids</td>
<td>Handouts</td>
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<td>04/05/11</td>
<td>Soil acidity</td>
<td>Sparks Chapter 9</td>
<td>HW5</td>
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<tr>
<td>04/12/11</td>
<td>Sulfide chemistry</td>
<td>Handouts</td>
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<tr>
<td>04/19/11</td>
<td>Chemistry of saline soils</td>
<td>Sparks Chapter 10</td>
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<td>04/26/11</td>
<td>Final</td>
<td>Lectures 8 through 12</td>
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*Note that the schedule may be subject to change; you'll be informed of any changes.