Soil Chemical Processes and Environmental Quality  
Environment and Natural Resources ENR 5262, Autumn 2015

INSTRUCTOR:
Dr. Nicholas T. Basta, Professor of Soil and Environmental Chemistry,  
410C Kottman Hall, 292-6282, basta.4@osu.edu

INSTRUCTOR ASSISTANT:
Brooke Stevens, 408A Kottman Hall, stevens.728@buckeyemail.osu.edu

TIME AND PLACE:
Lecture WF 9:10 to 10:05, Kottman Hall (KH) room 245  
Lab F 10:20 to 12:20, Kottman Hall (KH), room 403

PREREQUISITE: Chem 121, and 122 or 125, or graduate standing, or permission of instructor.  
CREDIT HRS: 3 (2 1-hr class; 1 2-hr lab).

COURSE DESCRIPTION:
A comprehensive study of biogeochemical processes in soil and water systems that impact  
biogeochemical cycles, food production and environmental quality and sustainability. Emphasis is  
placed on the effect of soil chemical processes on human and ecological health and ecosystem function. Fundamental biogeochemical processes including: soil solution/water chemistry, soil carbon/organic  
matter, soil minerals, precipitation/dissolution, adsorption reactions and models, redox chemistry, soil  
acidity, plant nutrient chemistry. Topics include restoration/remediation of contaminated soil;  
environmental fate of fertilizer, pesticides and impact on ecosystem quality; environmental fate of soil  
contaminants, reclamation of soil/water degraded from acidity (i.e., coal mining) or excess salinity (i.e.  
surface impact from subsurface shale fracturing). Laboratory component focuses on hands-on soil  
investigation/problem solving using wet laboratory soil analysis and analysis of results using modern  
techniques used for soil chemical investigations including U.S. EPA geochemical speciation models  
used to predict chemical reactions and chemical species in soil and aqueous environments.

COURSE OBJECTIVES:
After completion of this course, students should:
1. Have a comprehensive understanding of biogeochemical processes in soil systems (i.e., soil, water,  
   air, biotic) that impact environmental quality
2. Understand linkages between soil/environmental chemistry - human and ecological health and  
   ecosystem function (including food production -environmental quality /sustainability)
3. Be able to perform a soil biogeochemical investigation using laboratory data using MINTEQA2 and  
evaluate impact on ecosystem function.

POLICIES, EXAMINATIONS AND GRADING
Exam 1  
Exam 2  
Final Exam  
Laboratory Report s 5 reports @ 6% each  
Problem Sets 5 sets @ 2% each  

Grading  
A 92-100; A˙ 90; B+ 88; B 82-87; B´ 80; C+ 78; C 72-77; C´ 70; D+ 68; D 62-68; D´60; E < 60.  
LABORATORY (non-recitation sections) ATTENDANCE FOR THE ENTIRE 2 HR LAB PERIOD IS MANDATORY. LABORATORY THREE OR MORE UNEXCUSED ABSENCES WILL RESULT IN A FAILING GRADE FOR THE LAB.
TOPICAL OUTLINE
Soil and Water Chemical Environment
Biogeochemical phases in soil; environmental chemistry of soil solution and aqueous environments; activity and bioavailability; soil mineral and solid phase components and properties; soil organic matter chemistry and properties

Soil Chemical Reactions and Processes
Equilibrium-based and kinetic soil chemical processes, precipitation-dissolution reactions, solubility diagrams, adsorption reactions and models, soil chemical redox reactions.

Soil Environmental Chemistry/ Restoration of Degraded Soils
Chemistry of soil acidity and acid impaired soils; restoration of acid soil impacted from coal mining; restoration of salt degraded soil; soil chemical processes of fertilizer, pesticides and other organic chemical contaminants and their impact on water quality.

Soils and Chemical Pollution
Environmental fate and exposure from contaminants in soil. Restoration of urban, brownfield, and industrial contaminated soils. Concepts and methods of remediation of contaminated soil, remediation methods (soil washing, contaminant immobilization, phytoremediation, etc), bioavailability-based remediation, and long-term fate of contaminants.

TEXTBOOKS:
None required
Course notes provided on Carmen.

Other Textbooks and References for class:

ACADEMIC MISCONDUCT STATEMENT
Academic misconduct as defined by the university (Faculty Rule 3335-31-02) will not be tolerated.

DISABILITY STATEMENT
Students with disabilities who need accommodations should see Dr. Basta during office or contact him by telephone (614-292-6282) or e-mail (basta.4@osu.edu) to make arrangements. Special needs must be discussed and arrangements made well in advance (preferably before the first week of class) of when arrangements to accommodate specific needs are required. Special accommodations may be arranged through the OSU Office of Disability Service, 150 Pomerene Hall, 1760 Neil Ave., Telephone 614-292-3307, www.ods.ohio-state.edu.