INSTRUCTOR:
Dr. Nicholas T. Basta, Professor of Soil and Environmental Chemistry,  
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TEACHING ASSISTANTS (OKLAHOMA STATE):
Briana Wyatt  
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TIME AND PLACE:

**OHIO STATE:**
Lecture  WF 9:10 to 10:05, Kottman Hall 245  
Lab F 10:20 to 12:20, Kottman Hall 114

**OKLAHOMA STATE:**
Lecture  WF 8:10 to 9:05, Ag Hall 225  
Lab F 9:20 to 11:20, Ag Hall 168

PREREQUISITE: One semester of chemistry

CREDIT HRS: 3 (2 1-hr class; 1 2-hr lab).

COURSE DESCRIPTION:
A comprehensive study of soil biogeochemical processes relevant to food production, soil remediation and restoration. Emphasis is placed on soil and environmental chemical processes on human and ecological health, ecosystem function, and soil remediation. Water and soil solution chemistry; soil carbon/organic matter, soil minerals, precipitation/dissolution, adsorption reactions and models, redox chemistry, soil acidity. Restoration / remediation topics include of human and ecological contaminant exposure in soil-water systems; environmental fate of fertilizer, pesticides in agricultural soil; remediation of severely degraded coal mineland soils and water (acidity, other); remediation of salt degraded soil (i.e. surface impact from subsurface shale fracturing); remediation of contaminated (heavy metals, toxic organics) soil; restoration of urban soils. 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 soil remediation sciences based on environmental chemistry, human and ecosystem function (including food production).
3. Be able to perform a soil biogeochemical investigation using laboratory data using MINTEQA2 and evaluate impact on ecosystem function.

POLICIES, EXAMINATIONS AND GRADING

Exams, 3 @ 25% each  75%
Laboratory Reports  25%

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; F < 60.
LABORATORY ATTENDANCE FOR THE ENTIRE 2 HR LAB PERIOD IS MANDATORY.
TOPICAL OUTLINE
Water and Soil Solution Chemistry
Equilibrium concepts; fugacity; chemical speciation in water; carbonates and CO₂. Soil and water chemical speciation and solute transport; bioavailability, free ion activity model.

Soil Chemical Processes and Revegetation / Remediation
Soil chemical processes affecting revegetation; Precipitation-dissolution reactions, solubility diagrams, soil organic matter reactions, adsorption reactions and models, soil chemical redox reactions.

Soil Remediation and Environmental Chemistry
Restoration / remediation topics include of human and ecological contaminant exposure in soil-water systems; environmental fate of fertilizer, pesticides in agricultural soil; remediation of severely degraded coal mineland soils and water (acidity, other); remediation of salt degraded soil (i.e. surface impact from subsurface shale fracturing); remediation of contaminated (heavy metals, toxic organics) soil; restoration of urban soils.

TEXTBOOKS:
None required
Course notes provided on Carmen/Canvas at TOSU or D2L platform at OSU.

Recommended Textbook References

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, 098 Baker Hall, 113 W. 12th Ave.; Ph: 614-292-3307, http://www.ods.ohio-state.edu/