SUS- 7700A: SUSTAINABLE SOIL AND WATER

Course: Sustainable Soil and Water
3 credits 3 hrs/week.
Wed. 2:00-4:50pm, Spitzer School of Architecture, Rm 3M23

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Exploring sustainable management of soil and water at the interface with adaptation to sea level rise.

Bulletin Description
This lecture and field course for Landscape Architects, Architects, and Sustainability students will explore topics related to the conservation of soil, surface water, and groundwater in urban settings; understanding floodplains; treating polluted brownfields; the relation of soil and groundwater in natural and urban/designed settings; “sustainable details” such as porous infrastructure and pavements; field methods for understanding soil and ground water; and a hands-on exercise (if a site is found and approved) to convert a small site on campus to a rain garden, porous pavement, bioengineering, or other ground-water infiltration feature.

Further Description for Spring 2017:
This is a lecture and field course exploring ancient and contemporary approaches to manipulating soil and water in building human communities that conserve and sustain local resources over long periods of time. It is primarily for Landscape Architects, Architects and Sustainability students, and includes practical applications of principles and theory in realistic projects in NYC. The class will research and address complex topics related to conservation and management of soil, surface water and groundwater in urban settings undergoing social, political, climate and environmental changes.

This semester’s case study project will explore topics related to urban in-water infrastructure exemplified by the Greenpoint Manufacturing and Design Center’s collapsing timber crib wall in collaboration with Sara Durand of Queens College.

The course responds to current interest in “nature-based infrastructure,” preparing students to better understanding floodplains and coastal zones, the role of moisture in soil ecology, treating polluted soil in brownfields; the relation of soil and groundwater in natural and urban/designed settings and “sustainable details” such as porous infrastructure and water filtration using living organisms. It will combine lecture format, reporting on related research and activities, field methods for understanding soil and ground water; and design exercises applying student research on living filtration systems, porous pavement, bioengineering and/or other ground-water interactions.

Overview
The issues associated with water in urban development -- for example, the development of floodplains, distribution of water in areas of scarce resources, sea level rise, hydraulic fracturing and its effect on groundwater, loss and restoration of wetlands, over-extraction of ground water in arid land and designing conservation buffers -- facing the design fields require knowledgeable professionals and creative thinking in order to solve both mundane and urgent problems. While entry level architects, planners and landscape architects will be expected to be competent in understanding and addressing soil and water problems in their future professional projects, this course aims to prepare students to think beyond that,
reaching toward new solutions and approaches at the forefront of an advancing professional specialty in green infrastructure.

**Objectives:**
1. Mastery of basic geology and hydrology principles related to storm water, sediment transport and coastal zone management
2. Practice in assessing a variety of typical urban soil and water conditions and diagnosing problems
3. Understanding how soils and water affect architecture and landscape architectural design
4. Competence in choosing, adapting and designing nature-based or bioengineered solutions for water and soil management

**Topics covered:**
Below is a sample of lecture topics, some of which will be coordinated with excursions to local examples typical problem conditions and sustainable best practices:
1. Ancient and modern soil and water management techniques
2. Soil ecology/ biology of soil microorganisms/ living aspects of soil
3. Water movement in built environments
4. Sea level rise, coastal dynamics and development - context and responses
5. Desertification - context and responses
6. Urban agricultural soil - character, concerns and techniques for improvement
7. “Nature based infrastructure” storm water and erosion management
8. Bioengineering

**Basis of grades.**
Grades in this course will be based on a series of assignments including one-week design or research problems and a 3-4 week project with a written report, a midterm and final exam. Attendance is mandatory for all sessions.

Grading for the class will be determined according to the following criteria:
- 2 or 3 Short assignments on topical issues 20%
- Mid term exam on readings and lectures 30%
- Final exam on readings and lectures 30%
- Final project: research, conceptual design, presentation 20%

**Texts:**
*Design for Flooding: Architecture, Landscape, and Urban Design for Resilience to Climate Change*, Watson, Donald; Adams, Michele, John Wiley & Sons, 2011


Free web resources on green infrastructure to be announced.

**SCHEDULE 2017**

1. 2/1 Overview; Soil development; Relation of soil, water and urban agriculture/human health re: urban contaminants. **One week Assignment #1** The Standing Rock Sioux and the Dakota Access Pipeline: water, soil, heritage and oil.

2. 2/8 Historic and prehistoric agricultural soil/water management practices; **Discussion of Assignment #1. Assignment #2:** Soil/water remediation for urban farming. Reading for 2/17: *The Man Who Planted Trees*

3. 2/15. NO CLASS-MONDAY SCHED.

4. 2/22 FIELD TRIP to Greenpoint Manufacturing and Design Center project site,. Meet at project site: Manhattan Ave and Newtown Creek, 2:00 – 4:50 with Len Hopper’s Site Technology class. Reading for 3/2: *Design for Flooding*, p. 32-89

5. 3/1 Soil ecology and greenhouse/community gardening food production; permaculture; Discuss *The Man Who Planted Trees*. Reading for 2/24: *Healthy Soils for Sustainable Gardens*. **Assignment 2 due.**

6. 3/8 Surface and ground water; Soil-water interactions in floodplains and shorelines. Weather dependent site visit and soil probe- St. Nicholas Park. **Discuss Assign.#2**

7. 3/15 presentation of conceptual Design Solutions for GMDC. Reading for 3/16: *Sustainable Landscape Construction: Respect Waters of Life* p. 152-197


9. 3/29 Floodplain functions-soil, ground water, surface water, extreme events. Reading for 4/6: *Sustainable Landscape Construction* p. 113-148

10. 4/5 Urban receiving waters, Watershed planning for soil conservation: quality, sedimentation, dredging and related soil erosion, using NY Harbor as an example

April 12- SPRING BREAK, NO CLASS

11. **SATURDAY FIELD TRIP 4/22 – REPLACES 4/19 CLASS.** RHINEBECK, NY Omega Center for Sustainable Living. **(to be confirmed)** "The Omega Center for Sustainable Living, one of the greenest buildings in America, treats 100% of its wastewater with zero chemicals and net zero energy. They welcome students, teachers, activists, contractors, architects, elected officials, and others who want to
learn more about natural water reclamation, sustainable living, and green building.”

12. 4/26 Nature-based technologies for contaminated soil and water; Desertification; Xeriscaping/ Drought tolerant landscapes; Desertification Reading for 5/4: Sustainable Landscape Construction: Heal Injured Sites p. 71 -98

13. 5/3 Brownfields and Manufactured soils; Sustainable water use in developing communities; conserving natural self-cleaning ecosystems during urban development.

14. 5/10 presentation of final project for GMDC.

[5/18  Studio Reviews – No Class]

15. 5/25 Final Exam

Site visits.
Two site visits with are being planned, in which the class will meet knowledgeable professionals responsible for the respective projects: A water treatment specialist at Omega Sustainable Living Center, and a biologist/ community activist working on a variety of project in Newtown Creek.