COURSE SYLLABUS

ENST489Z Water Management in Urban Environment

1. General Information

Semester: Fall 2015

Meeting Time: Tuesday and Thursday 3:30pm - 4:45pm

Location: 0422 ANS (Animal Sciences/Ag. Engineering Bldg.)

Instructor: Dr. Masoud Negahban-Azar

Office: ANS 1430 (Animal Science/Agricultural Engineering Building)

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Office Hours: Wednesday, 3-4pm (or by appointment)

2. Course Information

2.1. Description

Relevant processes in pathways and fluxes of water in urban areas. Urban water balance and consequences of urbanization on surface and groundwater regimes. Effects of climate and hydrology. Quantity and quality of urban runoff, sources of pollution and behavior of contaminants. Ecological quality and processes associated with urban water. Design and planning for water quality and quantity management in urban water systems. Exploring engineered, and ecologically engineered alternatives for stormwater management.

2.2. Prerequisites: Calculus I (MATH 140, MATH 220, or equivalent)

2.3. Context

Effective, efficient management of water resources is essential to a sustainable urban area. Water must be supplied for domestic, commercial, and industrial use, as well as irrigation and maintaining and enhancing local environments (e.g., urban streams). In addition, storm water must be managed to prevent flooding and environmental damage, and used water, which contains heat, organic matter, nutrients, and other constituents that can be extracted and reused, must be collected and managed. Historically, with the exception of certain locations, such as the desert Southwest of the United States, water has been available in sufficient quantities, and providing supporting infrastructure has been relatively straightforward. As the populations increase and the U.S. becomes more urbanized, water is becoming increasingly scarce, leading to competition among users, one of which is urban areas.

We will explore the new approach to supplying and managing water and resource infrastructure to achieve urban sustainability. Examples of system components are also identified, as are challenges to implementing higher performing systems. This approach differs from the historical approach in several respects. First, water-supply options today include not only imported surface and groundwater, but also locally collected rainwater and recycled water. Second, all used water is reused, either to meet water-supply needs or to enhance and restore the environment. Finally, the waste stream (used water) is no longer viewed as a necessary "evil" that must be managed to minimize harm. Instead, it is considered a resource from which useful products can be extracted. Heat can be extracted directly. Organic matter can be removed and used for energy production and the production of soil-conditioning products. Nutrients can also be extracted and re-used.

2.4. Format:

ENST 489Z meets twice per week on Tuesday and Thursday during which time students participate in lectures, complete in-class problems, engage in discussions, and work on a group project. It is expected that all students will read the assigned material prior to class time. Homework will include assignments that ask questions based on the reading materials. Exams will cover both in-class material and readings. The project will be done in groups (three to four students), with peer evaluations used to inform individual grades. It is expected that groups will meet outside of class time to do their project. Groups will present their projects at the end of semester.

2.5. Course Website: www.elms.umd.edu

2.6. Required Text: Urban Water Engineering and Management (2010), 1st edition. M. Karamouz. CRC Press. ISBN-10: 1439813108

3. General Rules and Regulations

3.1. Grading:

Item	Points
Homework Assignments	500
Midterm Exam	200
Final Project	400
Final Presentation	100
Final Exam	300
Total Points Available	**1500**

3.2. Grade Rubric:

A+	97 - 100%	A	93 - 96%	A-	92 - 90%
B+	87 - 89%	B	83 - 86%	B-	82 - 80%
C+	77 - 79%	C	73 - 76%	C-	72 - 70%
D+	67 - 69%	D	63 - 66%	D-	62 -60%
F	59% or less				

3.3. Class Policies:

- **Missed classes:** With prior arrangements, the instructor will provide notes to students who cannot attend for acceptable reasons. Otherwise, students are responsible for obtaining class notes and assignments.
- **Missed exams:** Only in cases deemed acceptable by the instructor will missed exams be offered as a make-up. Missing an exam without a University Accepted excuse will result in a grade of zero on that exam.
- **Academic Honesty:** Please see the UM student honor pledge at www.shc.umd.edu

  1) Cheating – intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.

  2) Fabrication – intentional and unauthorized falsification or invention of any information or citation in any academic exercise.

  3) Facilitating academic dishonesty – intentionally or knowingly helping or attempting to help another violate any provision of the Academic Code.

  4) Plagiarism – intentionally or knowingly representing the works or ideas of another as one's own in any academic exercise.
- **Assignments:** Homework assignments will be given at least one week prior to their due date. Homework not provided to the instructor by the assigned due date will receive at most half of its graded credit.
- **Final Project**: The total project grade will be 75% of the paper grade and 25% of the peer evaluation grade. Projects not provided to the instructor by the assigned due date receive 10% reduction per day and will not be accepted after 4 days.
- **Electronics Use:** Please turn off and put away all cell phones before class. Laptop computers may be used for note taking only - no web surfing, IM, social networking or games allowed. If the Instructor deems that a computer is distracting the student or those around them, the student will not be allowed to use a computer during lectures.

- **Religious Observance:** Please inform the instructor of religious observances that will preclude you from attending a lecture or exam within the first two weeks of class.
- **Counseling:** If you feel that you may have a learning disability, you should contact the Counseling Center on campus (Shoemaker Hall 301.314.7651; www.inform.umd.edu/cc/index.htm).
- **Students with Disabilities:** If you have a documented disability and wish to discuss academic accommodations, please contact me as soon as possible.

4. Schedule

Week	Date	Topic	Reading	Objectives
1	Sep 1 and 3	Introduction and Urban Water Cycle		• Components of urban water cycle • Impacts of urbanization • Paradigm shift in urban water management (concept of sustainability)
2	Sep 8 and 10	Urban Water Hydrology		• Urban hydrologic processes • Rainfall calculations • Runoff estimation
3	Sep 15 and 17	Urban Water Hydrology		• Unit hydrographs • Climate effects • Hydrologic modeling
4	Sep 22 and 24	Water Supply		• Man-made and natural resources • Water supply challenges
5	Sep 29 and Oct 1	Water Demand		• Water demand forecasting • Water storage and distribution
6	Oct 6 and 8	Water Drainage (basics)		• Urban planning and stormwater drainage • Best management practices
7	Oct 13	Water Drainage (water flow)		• Open channel flow
	Oct 15	Midterm Exam		
8	Oct 20 and 22	Water Drainage (green infrastructures)		• Sediment basins • Bio-retention swales
9	Oct 27 and 29	Water Drainage (green infrastructures)		• Constructed wetlands
10	Nov 3 and 5	Water Drainage (green infrastructures)		• Infiltration systems • Porous pavement

11	Nov 10	Field trip: Sustainable Urban Water management in Practice	N/A	We will visit a residential development of Pembroke Woods Subdivision in Fredrick County. We will explore how several low impact development techniques have been employed to sustainably manage the urban water. These LIDs include bio-retention, grass swales, dry wells, filter/buffer strips, rain barrels, cisterns, and infiltration trenches, site fingerprinting, reduction in impervious area, and disconnection of impervious areas.
	Nov 12	Water Drainage (green infrastructures)		• Green roofs
12	Nov 17 and 19	Environmental Impacts (we will explore the impacts of urbanization on various water an environmental components in urban areas under sustainability perspectives)		• Effect on hydrologic cycle • Effects on water quality • Life cycle assessment
13	Nov 24	Tools and Techniques		• Simulation techniques • Optimization techniques
14	Dec 1 and 3	Climate Change (sustainability		• Climate change processes • Impacts on urban water system • Vulnerability and Adaptation
15	Dec 8 and 10	Final Project Presentations		
16	Dec 15	Final Exam		