ENV H 440 and 545: Water, Wastewater, and Health

Fall Quarter, 2014
Monday, Wednesday, & Friday, 11:30-12:20
Room: HSB T739

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OFFICE HOURS: By Appointment

COURSE DESCRIPTION:
This course will review the various aspects of water and wastewater as they relate to human health. Topics covered will include source water, basic treatment technologies for water and waste, chemical contaminants, microbial contaminants, and recreational water. This course will be of use for public health professionals, microbiologists, civil and environmental engineers, and environmental scientists.

COURSE OBJECTIVES:
On completion of this course, students will be able to:

1. Name and describe the role of the major water laws and regulations that control the quality of water, including drinking water, wastewater and natural water bodies
2. Understand the relationships between the various water laws and regulations
3. Describe the carbonate system in natural water sources and define its relationship to alkalinity
4. Understand the factors that affect the persistence, fate and mobility of human pathogens in water
5. Name the major chemical and microbial contaminant groups found in drinking water and describe their associated health effects
6. Describe the term watershed, recognize how water can become contaminated and explain the general concepts associated with watershed protection to minimize contaminants
7. Identify and describe the major components of drinking water treatment and understand their primary purpose in the overall treatment of drinking water
8. Explain the role of a water distribution system and describe how water in the distribution system can become contaminated and the techniques used to minimize contamination

9. Identify and describe the basic components of a water well, associated equipment such as pumps, the basic types of aquifers that supply water to wells, and how wells are constructed to minimize contamination
10. Describe how drinking water is disinfected using chemical compounds and ultraviolet irradiation
11. Name and understand the meaning and role of the basic measurements used to define the quality of municipal wastewater
12. Identify and describe the major components of municipal wastewater treatment and understand their primary purpose in the overall treatment of wastewater
13. Understand how municipalities control the discharge of industrial wastewater into the municipal system and how the basic regulations for industrial wastewater treatment
14. Name and describe the purpose of the basic components of a typical on-site wastewater disposal system
15. Understand the basic properties of soil and groundwater that affect the treatment of wastewater by onsite disposal systems
16. Describe the similarities between the basic components of an on-site wastewater disposal system and a municipal wastewater treatment facility
17. Describe the meaning of biosolids, know and understand the basic methods for treatment of biosolids, and be able to discuss the regulations controlling biosolids treatment, reuse and disposal
18. Describe the potential contaminants in recreational water, how recreational water quality is monitored and what techniques are used to treat water in pools and spas

TEXTS AND REFERENCES:
The required text for this course is Water and Wastewater Technology, 7th ed. by Mark J. Hammer and Mark J. Hammer, Jr. Additional reading assignments and course materials will be provided as handouts or are available on the web. The following texts are also recommended references for this course:

<u>Books (may be borrowed from instructor)</u>-
Disinfection, Sterilization and Preservation, 5th edition, LWW
Metcalf and Eddy's Wastewater Engineering: Treatment and Reuse, McGraw-Hill
Water Quality and Treatment, 5th edition, AWWA
Water Technology, 3rd Edition, IWA Publishing

<u>Journals (available online through UW libraries)-</u>
Journal of American Water Works Association
Water Science and Technology
Water Research
Environmental Science and Technology

CLASS PARTICIPATION:
Although class attendance is not expressly required, students will be expected to participate in classroom discussion and in-class group activities. Students will not have the opportunity to earn class participation credit for course periods during which they are absent.

COURSE FORMAT:
Class periods will be divided into 5 modules: Introduction, Background Science, Drinking Water, Wastewater, and Recreational Water. Some Mondays and Wednesdays will be an interactive lecture format, followed by Fridays dedicated to student-led discussion. The Drinking Water and Wastewater modules will be concluded with student project presentations led by graduate students. See the last page of syllabus for the schedule outline.

GRADING OPPORTUNITIES:

For the sake of this class, letter and numerical grades will typically be distributed according to the university grading scale between the following standards:

A (4.0) = Excellent and exceptional work (typically >>95% of available points)

D (1.0) = Deficient work (typically <66% of available points)

It is expected that most students will perform at a level of ~3.5.

Graduate Students (545):

Points will be available according to the following percentage breakdown:

Curriculum Vitae (5%): Each student is required to provide a 1-2 page CV describing the student's background and interests. CVs will be due by the third class period.

Homework (20%): Students will have the opportunity to complete 2 homework assignments, totaling 20% of the overall grade. Homework assignments will be due as indicated on the course outline. Late assignments may be penalized 10% of point value for each class period that they are late.

Midterm Exam (20%): The take home midterm exam will be handed out in class on the 2nd of November. It will be due on the 5th. It will consist primarily of short answer questions, but may include multiple choice and fill-in the blank questions as well. Exam will be open book and open note.

Class Participation (10%): Students will be expected to participate in group discussion and learning activities. Fridays will largely be reserved for group discussion of student chosen journal articles on a specific topic and group presentations. Participation in group projects will be evaluated by peer evaluation.

Papers/Presentations (20%): Student groups will prepare a 4-8 frame poster that will define the problem, provide background on potential effects on human health and the environment, compare at least two approaches found in the literature and then present and justify a solution suitable for this scenario. Each group of up to 8 students will be led by 1-2 graduate students and the poster will be presented to the instructors on scheduled dates at the end of the Drinking Water and Wastewater modules. All students in groups should be prepared to defend poster.

Final Exam (25%): Final exam will be offered at the formally scheduled time, December 10th 2:30-4:20. Final exam will be comprehensive and will consist of short answer, multiple choice, true/false-explain, and problem solving questions. Exam will be open book and open note.

Undergraduate Students (440):
Points will be available according to the following percentage breakdown:
Curriculum Vitae (5%): Each student will be required to provide a 1-2 page CV describing the student's background and interests. CVs will be due by the third class period.
Homework (30%): Students will have the opportunity to complete 2 homework assignments, each worth 15 % of the overall grade. Homework assignments will be due as indicated on the course outline. Late assignments will be penalized 10% of point value for each class period that they are late.
Midterm Exam (20%): The take home midterm exam will be handed out in class on the 2nd of November. It will be due on the 5th. It will consist primarily of short answer questions, but may include multiple choice and fill-in the blank questions as well. Exam will be open book and open note.
Class Participation (10%): Students may earn class participation credits by participating in classroom discussions (asking and answering questions) and answering extra-credit questions (via email).
Papers/Presentations (10%): Student groups will prepare a 4-8 frame poster that will define the problem, provide background on potential effects on human health and the environment, compare at least two approaches found in the literature and then present and justify a solution suitable for this scenario. Each group of up to 8 students will be led by 1-2 graduate students and the poster will be presented to the instructors on scheduled dates at the end of the Drinking Water and Wastewater modules. All students in groups should be prepared to defend poster.
Final Exam (25%): Final exam will be offered at the formally scheduled time, December 10th 2:30-4:20. Final exam will be comprehensive and will consist of short answer, multiple choice, true/false-explain, and problem solving questions. Exam will be open book and open note.

ACADEMIC ACCOMODATIONS: To request academic accommodations due to disability, please contact Disabled Student Services, 448 Schmitz, (206) 543-8924 (V/TTY). If you have a letter from Disabled Student Services indicating that you have a disability that requires academic accommodations, please present the letter to me so we can discuss the accommodations you might need in this class.

COURSE RULES

1. Come to class; please let me know ahead of time if you can not make it.
2. Arrive on time
3. Turn in assignments on time
4. Come to class prepared (keep up with reading)
5. Be courteous (No newspapers, audible cell phones, PDAs, beepers)
6. Food and drinks are welcome (but keep it quiet)
7. Refrain from unnecessary talking, but ASK QUESTIONS
8. Try to remain awake (at least no snoring please)
9. Let me know how I am doing (if I am moving too fast, not being clear, or otherwise not getting the message across, I need to know.)

Date	Day	Lecture Topic	Lecturer	Homework Assignment
24-Sep	W	Introduction/History of Water and Waste Treatment	Meschke	
26-Sep	F	Water law and Regulation/Water Rights	Meschke	
29-Sep	M	Water Chemistry/Chemical Contaminants I	Onstad	CV Due
1-Oct	W	Chemical Contaminants II	Onstad	
3-Oct	F	Student Discussion: Hydrofracking Impacts on Water Quality and Health	Onstad	
6-Oct	M	Water Microbiology/Microbial Contaminants I	Meschke	
8-Oct	W	Microbial Contaminants II	Meschke	
10-Oct	F	Student Discussion: Waterborne disease	Meschke	HW1 due
13-Oct	M	Drinking Water Case Study Introductions	Meschke/Onstad	
15-Oct	W	Conventional Municipal Drinking Water Treatment\Seattle Treatment Systems	Onstad	
17-Oct	F	Advanced Drinking Water Treatment Processes/Distribution Systems	Onstad	
20-Oct	M	Drinking Water Disinfection	Onstad	
22-Oct	W	Cross Connection Issues/Contamination of Drinking Water	Easterberg	
24-Oct	F	Groundwater	Meschke	
27-Oct	M	Wells- Introduction/Types/Components	Meschke	HW2 due
29-Oct	W	Case Study Presentations		
31-Oct	F	Case Study Presentations		Midterm Available
3-Nov	M	Wastewater Case Study Introductions	Meschke/Onstad	Midterm Due
5-Nov	W	Introduction to Wastewater Treatment/Collection Systems/Combined Sewer Overflows	Meschke	
7-Nov	F	Conventional Municipal Waste Treatment\Wastewater Disinfection	Onstad	
10-Nov	M	Industrial Wastewater Treatment	Onstad	
12-Nov	W	On-Site Waste Disposal Systems I	Meschke	
14-Nov	F	On-Site Waste Disposal Systems II	Meschke	
17-Nov	M	Disposal and Treatment of Biosolids/Septage	Meschke	
19-Nov	W	Wastewater Sanitation in the Developing World	Meschke	
21-Nov	F	Water Reuse	Meschke	HW3 due
24-Nov	M	Case Study Poster Presentations		
26-Nov	W	Case Study Poster Presentations		
28-Nov	F	NO CLASS - Thanksgiving Holiday		
1-Dec	M	Shellfish and Recreational Water: Natural Waters	Meschke	
3-Dec	W	Recreational Water: Pools and Hot Tubs **(Meet at IMA)**	Easterberg	
5-Dec	F	Student Discussion: Recreational Water	Onstad	
10-Dec	W	Final Exam 2:30-4:20		