CE 453

Water Quality Control

Fall 2013

Catalogue Description: **CE 453 - Water Quality Control**. Water quality criteria and fundamentals of acceptability. Natrual purification of surface waters. Processes employed in the treatment of water and wastewater.

Goals: **This course is designed for junior/senior undergraduates students (also for 1st-year graduate students lacking required background) in Civil and Environmental Engineering to learn the fundamentals of water quality and distribution systems,wastewater collection systems, and water as well as wastewater treatment technologies and design strategies.**

Instructor:
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Teaching Assistant:
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Grading Criteria:

Two Midterm Exams	20% (10% each)
Final Exam	25%
Quizzes	10% (5% each)
Homework Assignments	20%
Class Project & Presentation	15%
Class Participation	10%
	100%

Textbooks: Hammer, M.J., and Hammer, M.J., Jr., "**Water and Wastewater Technology**," 7th Edition, Prentice- Hall, Inc., Englewood Cliffs, New Jersey, 2012.

Class Notes: Textbook chapters highlights are posted on **Blackboard**.

Collaboative Learning Strategy: During the class, we will be practicing the important concepts and skills of collaborative learning in small group of three or four students. The strategy is designed to increase your mastery of the course content. You will be expected to actively participate in an effort to ensure your own and your "team-mates" understanding of the ideas presented in the class. We need your commitment to demonstrate a willingness to contribute ideas, listen to others, and to be a constructive force in the learning process.

Schedule for Exams and Quizzes:

Session	Date	Schedule
1	08/28	
2	09/04	
3	09/11	**Quiz 1**
4	09/18	
5	09/25	
6	10/02	**Midterm 1**
7	10/09	
8	10/16	**Quiz 2**
9	10/23	
10	10/30	
11	11/06	**Midterm 2**
12	11/13	
13	11/20	
14	11/27	**Thanksgiving recess**
15	12/04	**Term Project Presentation**
16	12/11	**Final Exam**

Students with Disabilities:

Any student requesting academic accommodation based on disability is required to register with Disability Services and Programs Office (DSPO) each semester. A letter of verification for approved accommodations can be obtained from DSPO. Please be sure the letter is delivered to the instructor (or the TA) as early in semester as possible. DSPO is located in STU 301 and is open 8:30am – 5:00pm, Monday through Friday. The phone number for DSPO is (213) 740-0776. (This statement is suggested by the office of the Provost).

Academic Integrity:

The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats the intent of an examination or other class work is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tension accompanying examinations. When the professor determines that a violation has occurred, appropriate action, as determined by the instructor, will be taken.

Although working together is encouraged, all work claimed as yours must in fact be your own effort. Students who plagiarize the work of other students will receive zero points and possibly be referred to Student Judicial Affairs and Community Standards (SJACS).

All students should read, understand, and abide by the University Student Conduct Code listed in SCampus, and available at: http://web-app.usc.edu/scampus/university-student-conduct-code/

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COURSE SYLLABUS

1. BACKGROUND: WATER CHEMISTRY (1.5 weeks)

Elements, radicals, and compounds
Chemical water analysis
Hydrogen ion concentration and pH
Chemical equilibria
Chemical kinetics
Gas solubility
Alkalinity
Colloids and coagulation
Organic compounds
Organic matter in wastewater
Laboratory chemical analyses

2. WATER MICROBIOLOGY (2.0 weeks)

Bacteria and flingi
Viruses
Algae
Protozoa and multicellular animals
Aquatic food chain
Waterbome diseases
Coliform bacteria as indicator organisms
Tests for the coliform group
Testing for enteric viruses
Biochemical oxygen demand
Biological treatment systems

3. HYDRAULICS and HYDROLOGY (3 weeks)

Water pressure
Pressure-velocity-head relationships
Flow in pipes under pressure
Centrifligal pump characteristics
System characteristics
Equivalent pipes
Gravity flow in circular pipes
Flow measurement in pipes, and open channels
Amount of storm runoff
Flow in streams and rivers
Hydrology of lakes and reservoirs
Groundwater hydrology

4. WATER QUALITY and POLLUTION (1 week)

Quality of surface waters
Water quality in flowing waters
Water quality in impounded waters
Groundwater quality
Water quality standards
Microbiological quality of drinking water
Chemical quality of drinking water

5. WATER DISTRIBUTION SYSTEMS and WATER TREATMENT(2.5 weeks)

Water quality and pressure requirements
Municipal fire protection requirements
Surface-water intakes
Mixing and flocculation
Sedimentation
Flocculator-clarifiers
Filtration
Turbidity removal
Taste and odor control
Synthetic organic chemical removal
Iron and manganese removal
Precipitation softening
Fluoridation
Chlorination
Chlorination by-products
Ozone
Disinfection
Ion exchange softening and nitrate removal
Removal of dissolved salts
Sources of wastes in water treatment
Dewatering and disposal of wastes from water treatment plants

6. WASTEWATER FLOWS, CHARACTERISTICS AND TREATMENT (3 weeks)

Domestic wastewater
Industrial wastewater
Infiltration and inflow
Considerations in plant design
Preliminary treatment
Pumping stations
Clarification
Biological filtration
Rotating biological contactors
Biological aeration
Stabilization ponds
Effluent disinfection
Individual household disposal systems

Characteristics and quantities of waste sludges
Selection and arrangement of sludge processes
Gravity sludge thickening
Thickening of waste activated sludges
Anaerobic digestion
Aerobic digestion
Pressure filtration
Centrifugation
Composting
Agricultural land application
Incineration and drying
Odor control

Effective Class Participation

Please note the following suggestions for effective class participation:

1. Make every effort to interact with your class partner(s).
2. Try to stay active throughout the class period.
3. Don't hesitate to ask questions in class.
4. Share your ideas with the rest of us.
5. Don't hesitate to ask the instructor to repeat himself.
6. Keep an eye on your partner not to fall asleep in class!!
7. Try to bring new ideas to class.
8. Don't read unrelated materials in class.
9. Share your ideas for class improvement with your instructor.
10. Put your fair share of efforts in preparing the term projects and the term paper. Be cooperative at all times.
11. Discuss your term paper and term project with the instructor periodically.
12. Come to class prepared.
13. Help your instructor make the class interesting.
14. Discuss your concerns and problems (if any) about the course with the instructor. He will do his best to accommodate your suggestions.
15. Late homework is not accepted.
16. Lap top use in class is unacceptable.
17. Tardiness is unacceptable.

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Term Project

Student groups (3 students in each group) will be required to present a term project which will constitute 15% of the semester grade. A list of suggested topics is provided below. Students are required to submit a choice of topics by **Septembet 18th, 2013**.

A 20 minute Powerpoint presentation on the term project is mandatory. Student presentations will be made in class on **December 4th, 2013**. A sign up sheet will be passed around in class on **November 27th, 2013**.

Suggested Topics

1. **History of Sewerage System:** Social, Economic, Public Health, Engineering Perspectives, Sustainability

2. **Energy Recovery in Hyperion Wastewater Treatment Plant:** Historical, Socioeconomic, Engineering Perspectives, Sustainability

3. **Water Supply History in Los Angeles:** Socioeconomic, Public Health, Engineering Perspectives, Sustainability

4. **Los Angeles Drinking Water Distribution and Treatment:** History, Socioeconomic, Public Health, Engineering Perspectives, Sustainability

5. **Water Pipes and Sewer Pipes Rehabilitation Methods:** History, Public Health, Engineering Perspectives, Sustainability

6. **Water Reclamation and Reuse in Los Angeles County:** History, Public Health, Engineering Perspectives, Sustainability

7. **Stormwater Management in Los Angeles County:** History, Impact on Construction Industry, Design Criteria, Sustainability

8. **Seawater Desalination in Southern Caifornia:** Technology, Historical Perspective, Economics, Engineering Challenges, Sustainability

9. **Natural and Constructed Wetlands for Water Treatment:** Historical Perspective, Public Health, Engineering Design Criteria, Sustainability

10. **Wastewater Collection and Treatment in Los Angeles County:** History, Public Health, Engineering Perspectives, Sustainability