CATALOGUE DESCRIPTION:


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: Professor Mike Pirbazari (Dr. P)
Office: KAP 260; Phone: (213) 740-0592
E-mail: pirbazar@usc.edu
Office hours: TBA; also by appointment
Class Time: Wednesday, 6:30 to 9:10pm
Class Location:
Internet address: http://www.usc.edu/dept/civil_eng/Dept/ce453

TEACHING ASSISTANT: To be determined

GRADING CRITERIA:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Two Midterm Exams</td>
<td>20% (10% each)</td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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<tr>
<td>Quizzes</td>
<td>10% (5% each)</td>
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<tr>
<td>Homework Assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Class Project &amp; Presentation</td>
<td>15%</td>
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<tr>
<td>Class Participation</td>
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100%

TEXTBOOKS:


CLASS NOTES: Textbook chapters highlights are posted on the Blackboard.
Collaboative Learning Strategy:

During the class, we will be practicing the important concepts and skills of comparative 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:

<table>
<thead>
<tr>
<th>Session</th>
<th>Date</th>
<th>Schedule</th>
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<tbody>
<tr>
<td>1</td>
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<td>2</td>
<td>08/31</td>
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<td>3</td>
<td>09/07</td>
<td>Quiz 1</td>
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<td>4</td>
<td>09/14</td>
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<td>6</td>
<td>09/28</td>
<td>Midterm 1</td>
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<td>8</td>
<td>10/12</td>
<td>Quiz 2</td>
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<td>10/19</td>
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<td>10</td>
<td>10/26</td>
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<tr>
<td>11</td>
<td>11/02</td>
<td>Midterm 2</td>
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<tr>
<td>12</td>
<td>11/09</td>
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<td>11/16</td>
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<td>14</td>
<td>11/23</td>
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<td>15</td>
<td>11/30</td>
<td>Term Project Presentation</td>
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<td>16</td>
<td>12/07</td>
<td>Final Exam (7:00 to 9:00pm)</td>
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Note: 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).
1. **BACKGROUND: WATER CHEMISTRY (2 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 weeks)**
   - Bacteria and flingi
   - Viruses
   - Algae
   - Protozoa and multicellular animals
   - Aquatic food chain
   - Waterborne 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
   - Centrifugal 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 (3 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.
Term Project

Each student 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 September 14th, 2011.

A 20 minute Powerpoint presentation on the term project is mandatory. Student presentations will be made in class on Nov. 30th, 2011. A sign up sheet will be passed around in class on Nov. 16th, 2011.

Suggested topics

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

2. Energy Recovery in Hyperion Wastewater Treatment Plant: Historical, Socio-economic, Engineering Perspectives, Sustainability


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

5. Removing Arsenic from Groundwater in Developing Countries: History, Public Health, Engineering Considerations, Sustainability

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

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