San Francisco State University  
School of Engineering  
Civil Engineering  
Spring 2017

Course Outline for ENGR 434 Principles of Environmental Engineering

**Bulletin Description:**
ENGR 434 Principles of Environmental Engineering (3 units)  
Prerequisite: ENGR 304 (may be taken concurrently), CHEM 115.  
Principles and fundamentals of environmental engineering. Topics include water resources, ground hydrology, water quality, water chemistry, water and wastewater treatment, air quality, and solid waste management.

**Textbooks:**
2. Class Reader (and all course material including HW) on SFSU ILearn

**References:**

**Coordinator:**
Professor Elahe Enssani, Ph.D., Meng., PE, REA  
Civil Engineering

**Prerequisites by Topic:**
1. Basic chemistry: Chem 115 or Chem 180  
2. Fluid Mechanics: ENGR 304 (may be taken concurrently)

**Course Objectives**
Develop student understanding of the basic concepts in water resources. [A1,B.1, B.2]  
Develop student understanding of the fundamental principles of water chemistry as needed in environmental engineering. [A.1, B.1]  
Develop student understanding of the fundamentals of water quality parameters and criteria. [B1, B4]  
Develop student understanding of the fundamentals of water treatment processes. [A.1, A.2, B1, B4]  
Acquaint student with fundamentals of wastewater collection systems design. [A.2, B.1]

---

1 Indexes in brackets refer to the objectives and outcomes of the School of Engineering.  
2 Numbers in brackets refer to evaluation methods used to assess student performance.
Topics:
1. Hydrologic Cycle.
2. Municipal Water consumption and water resources.
3. Ground water hydrology.
7. Water chemistry.
10. Water treatment processes.
11. Wastewater collection, sewer systems.
12. Wastewater treatment processes.
13. Solid Waste/Hazardous Waste Management
14. Air Quality Criteria/Management
15. Contemporary issues Global Climate Change/Sustainability/Energy and Environment

Professional Component:

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Sciences</td>
<td>66%</td>
</tr>
<tr>
<td>Engineering Design</td>
<td>34%</td>
</tr>
</tbody>
</table>

Performance Criteria:

Objective 1: Develop student understanding of the basic concepts in water resources.
1.1 The student will demonstrate an ability to design simple reservoirs and water distribution systems. [1, 2, 3]
1.2 The student will demonstrate an ability to analyze simple distribution piping networks.

Objective 2: Develop student understanding of the fundamental principles of water chemistry as needed in environmental engineering.
2.1 The student will demonstrate a knowledge of the basic concepts such as equivalent weight, moles, normality, molarity, PPm, etc. [1, 2, 3]
2.2 The student will demonstrate a knowledge of the fundamental chemical laws such as acid-base equilibria, mass action, Dalton’s and Henry’s law. [1, 2, 3]

Objective 3: Develop student understanding of the fundamentals of water quality parameters and criteria.
3.1 The student will demonstrate knowledge of the common water quality parameters such as TDS, Turbidity, etc. [1, 2, 3]
3.2 The student will demonstrate an understanding of the United States EPA primary and secondary water quality standards. [1, 2, 3]

Objective 4: Develop student understanding of the fundamentals of water treatment processes.
4.1 The student will demonstrate a knowledge of the common water treatment processes such as disinfection, sedimentation, coagulation and filtration. [1, 2, 3]
4.2 The student will demonstrate a skill in implementing design parameters in environmental engineering design. [3]

1 Indexes in brackets refer to the objectives and outcomes of the School of Engineering.  
2 Numbers in brackets refer to evaluation methods used to assess student performance.
Objective 5: Acquaint student with fundamentals of wastewater collection systems design.
5.1 The student will demonstrate a knowledge of the design of a simple sewer line. [1,2,3]

Relationship to Other Courses:
This is the first course in the environmental engineering area. The prerequisite courses provide students with the knowledge in basic fluid movement and fundamentals of chemistry required to understand water chemistry concepts. Therefore, this is an introductory course. A variety of subjects will be new to the students such as some basic water laws and United States Environmental Protection Agency’s Primary and Secondary drinking water standards.

Spring 2017
Instructor: Professor Elahe Enssani, Ph.D., Meng., PE, REA
Office: SCI 168
Phone/Text: 415-640-7754
Email: enssani@sfsu.edu

Office Hours
WF: 10:30 AM-11:00 AM, and,
By Appointment

Class Schedule:
Class Meetings: MWF 11:10 AM-12:00 PM
Room: HSS 380

Evaluation:
1. Weekly homework assignments 20%
2. Exam I 35% Wednesday March 15th
3. Exam II 35% Wednesday May 3rd
4. Term Paper 10% Proposal due: March 29th
Paper due: May 12th
5. Class Attendance and Participation Bonus Point
6. Please Note: NO FINAL EXAM

Homework Submittal, Homework Grading and Missed Exam Policy

Homework assignments will be posted on ILearn and must be submitted promptly at the end of lecture on the designated due date (usually one week after posting). Solutions will be posted 5:00 PM of the due date on ILearn. You should not plan to use lecture as a time to finish your homework. Late homework will not be accepted. Grading of homework will focus on evaluating

1 Indexes in brackets refer to the objectives and outcomes of the School of Engineering.
2 Numbers in brackets refer to evaluation methods used to assess student performance.
effort and solution procedure, rather than the accuracy of numerical results. There will be no makeup exam.

Course plan *(schedule of lecture topics is subject to change)*
<table>
<thead>
<tr>
<th>Week number</th>
<th>Week of</th>
<th>Lecture topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/23</td>
<td>Introduction to Environmental Engineering: Water, air, land Chapter 1</td>
</tr>
<tr>
<td>2</td>
<td>1/30</td>
<td>Water Resources: Hydrologic Cycle, Municipal Water Consumption Chapters 2, 3.1, 5, 9.3</td>
</tr>
<tr>
<td>4</td>
<td>2/13</td>
<td>Reservoirs and Transmission Facilities Chapter 4 HW II</td>
</tr>
<tr>
<td>5</td>
<td>2/20</td>
<td>Distribution Systems Chapter 6.4-6.10 HW III</td>
</tr>
<tr>
<td>6</td>
<td>2/27</td>
<td>Water Law Handout Class Groundwater Hydrology Chapter 3.4-3.15 HW IV</td>
</tr>
<tr>
<td>7</td>
<td>3/06</td>
<td>Storm Water Management, Chapter 7.10-7.18 No HW assigned due to exam</td>
</tr>
<tr>
<td>8</td>
<td>3/13</td>
<td>Review for Exam Exam I Wednesday March 15</td>
</tr>
<tr>
<td>9</td>
<td>3/20</td>
<td>Spring Recess</td>
</tr>
<tr>
<td>10</td>
<td>3/27</td>
<td>Water Quality parameters Chapter 3.3, 3.16 Water Chemistry Class Notes Paper Proposal Due Wednesday 3/29 HW V</td>
</tr>
</tbody>
</table>

1 Indexes in brackets refer to the objectives and outcomes of the School of Engineering.
2 Numbers in brackets refer to evaluation methods used to assess student performance.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Chapter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>4/03</td>
<td>Drinking water Standards, Water Treatment Processes</td>
<td>Chapter 9.3-9.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW VI</td>
</tr>
<tr>
<td>12</td>
<td>4/10</td>
<td>Disinfection</td>
<td>Chapter 11.21-11.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW VII</td>
</tr>
<tr>
<td>13</td>
<td>4/17</td>
<td>Solid Waste /Hazardous Waste Management</td>
<td>Class Handout</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW VIII</td>
</tr>
<tr>
<td>14</td>
<td>4/24</td>
<td>Waste water Collection systems</td>
<td>Chapter 7.1-7.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No HW assigned due to exam</td>
</tr>
<tr>
<td>15</td>
<td>5/01</td>
<td>Review for Exam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exam II Wednesday May 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Waste water Treatment Processes</td>
<td>Chapter 9.1-9.2</td>
</tr>
<tr>
<td>16</td>
<td>5/08</td>
<td>Air Quality Parameters, Air Pollution, Climate Action</td>
<td>Class Handouts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Term Paper due Friday May 12</td>
</tr>
</tbody>
</table>

1 Indexes in brackets refer to the objectives and outcomes of the School of Engineering.
2 Numbers in brackets refer to evaluation methods used to assess student performance.