CE 333 – 13 WATER SUPPLY AND DRAINAGE DESIGN
Winter 2001

Instructor Information:
Instructor: Robert Pitt

Current Catalog Data:
Water requirements; wastewater characteristics. Hydraulics and design of sewers; distribution and reuse of water. Development of water supplies; design consideration (1.5 D, 1.5 S)

Required Textbook:

Supplemental Textbooks (on overnight reserve at Sterne library):

Course Goals:
Learn fundamentals of water supply, sanitary wastewater and stormwater drainage. Integrate designs for assigned local design area. Apply decision analyses to select most efficient solution. Present design solutions and literature research in a professional manner.

Course Objectives:
1. Use the locally available libraries (Sterne and Lister Hill at UAB, Birmingham City Library) to locate information regarding locally relevant issues of water supply and drainage.
2. Appropriately apply design equations (Manning’s, Darcy-Weisbach, and Hazen-Williams) to water supply and storm drain problems.
3. Estimate water supply, wastewater and stormwater flow rates for a given area.
4. Use EPANET software to evaluate your water supply design for an assigned neighborhood. Use the software to modify the design as needed. (EPANET available at http://www.epa.gov/)
5. Use SWMM software to evaluate both a wastewater and a separate stormwater design for your assigned neighborhood. The software will be used to modify the design as needed. (SWMM also available at http://www.epa.gov/)
6. Present the results of your research on an assigned, locally relevant issue to the rest of the class in accordance with the given guidelines.

Prerequisite by Topic:
Basic algebra.

First Day of Class: Wednesday, January 3, 2001
Holiday (MLK day): Monday, January 15, 2001
Last Day of Class: Wednesday, March 7, 2001
Final Exam: Monday, March 12, 2001 (1 – 4 pm)

Schedule
Except where noted, homework due one week after assigned. Projects due one week after computer lab session (except for storm sewer design, which is due on the day of the final. Computer lab sessions will be scheduled.

<table>
<thead>
<tr>
<th>Date</th>
<th>Class Topics</th>
<th>Reading (Text pages noted in parentheses)</th>
<th>Homework Assigned</th>
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</thead>
<tbody>
<tr>
<td>W, Jan. 3</td>
<td>Introduction (history of water supply and drainage)</td>
<td>Chapter 1 and handout (p. 1-9)</td>
<td>Library Assignment (due Jan. 22)</td>
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<tr>
<td>M, Jan. 8</td>
<td>Introduction to applied hydraulics</td>
<td>Chapter 2 (p. 10-42);</td>
<td>2.3, 2.5, 2.9</td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Text</td>
<td>Handouts</td>
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<tr>
<td>W, Jan. 10</td>
<td>(pipe, pump and open channel)</td>
<td>Chapter 8 (p. 269-301)</td>
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<tr>
<td>M, Jan 15</td>
<td>MLK Day Holiday, no class</td>
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<td>W, Jan. 17</td>
<td>Population estimation and water forecasting</td>
<td></td>
<td>Handouts</td>
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<td>M, Jan. 22</td>
<td>Water Supply Design</td>
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<td>Handouts</td>
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<td>W, Jan. 24</td>
<td>Use of EPANET for water supply system designs (computer lab session)</td>
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<td>Handouts</td>
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<td>M, Jan. 29</td>
<td>Wastewater flows and measurements</td>
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<td>Chapter 3 (p. 60-99)</td>
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<td>W, Jan. 31</td>
<td>Inflow and infiltration, CSOs, SSOs, Biological transformations in sewers</td>
<td>Chapter 6 (p. 201-223); Chapter 7 (p. 232-237, 241-250; 252-268)</td>
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<td>M, Feb. 5</td>
<td>Sewer appurtenances</td>
<td>Chapter 5 (p. 153-200)</td>
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<td>W, Feb. 7</td>
<td>Sanitary sewer design</td>
<td>Chapter 4 (p. 100-131; 140-152)</td>
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<tr>
<td>M, Feb. 12</td>
<td>Use of SWMM for sanitary sewer design (computer lab session)</td>
<td></td>
<td>Handouts</td>
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<td>W, Feb. 14</td>
<td>Watershed delineation and use of soils maps</td>
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<td>M, Feb. 19</td>
<td>Rainfall and runoff estimation methods</td>
<td>Chapter 4 (p. 132-134); Handouts</td>
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<td>W, Feb. 21</td>
<td>Stormwater drainage design</td>
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<td>M, Feb. 26</td>
<td>Pumps and pump systems</td>
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<td>W, March 5</td>
<td>Use of SWMM for storm sewer design and evaluation (computer lab session)</td>
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<td>Handouts</td>
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<td>W, March 7</td>
<td>Local water supply, wastewater and stormwater issues</td>
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**Design Activities:**
Examine local development practices and regulations. Develop understanding of local issues relating to water supply and drainage design, and how they affect local practices and regulations.

**Computer Activities:**
Reviews of available water supply and rainfall/runoff computer models early in class. Three major computer-assisted design assignments will also be conducted.

**Demonstration of Written Communication Skills:**
All examinations are by written project reports. Part of the grading for any report is the ability to communicate effectively and professionally within the given guidelines. The initial literature review of current topics is a written assignment where the students learn numerous aspects of library and Internet research.

**Demonstration of Oral Communication Skills:**
Oral presentations are given by students on local issues relating to the subject material.
Inter-disciplinary and Project Work: Students are encouraged to work together outside of class on their design, computer, and research projects.

Understanding of Ethical, Social and Economic Considerations:
Safety issues and environmental protection are fundamental in water supply and drainage design and conflicts are inherent. Resolution of these conflicts is an important aspect of this class. Economic considerations are also used in the selection process. Presentations and lectures may be used as an opportunity to review the conflicts inherent between textbooks and actual practice in the field.

Estimated ABET Category Content:
1. Engineering Science 1.5 Semester Hours or 50%
2. Engineering Design 1.5 Semester Hours or 50%
3. Mathematics None
4. Other None

Major Class Assignments:
• Several assignments will be made this term that will comprise most of your term grade.
• The first assignment to be made will be a research topic (a library assignment will be due on January 22 and the short presentation will be given on the day of the final).
• Water balance of your household water use and wastewater production. You will determine a typical usage rate of water and production of wastewater based on at least one week’s monitoring in your home.
• You will design a water supply system for a neighborhood and confirm the design using EPANET.
• You will evaluate your design of a sanitary sewer system for the same neighborhood using EPA’s SWMM model (TRANSPORT module).
• You will evaluate your design of a storm sewer system for the same neighborhood using EPA’s SWMM model (RUNOFF module).

Notes:
1. The class examinations will be composed of project design assignments, as listed above.
2. An original research presentation will also be required. A library assignment will be due on Monday, January 22, 2001, and the presentation will be made on the day of the final, Monday, March 12, 2001.
3. Environmental engineering practice requires cooperative efforts between many disciplines and other engineers. In addition, accuracy and complete documentation of procedures and information sources is mandatory. Any presentations (written or oral) must also be of a professional quality. In order to gain appropriate experience and to make your engineering education as relevant as possible to engineering practice, the following grading criteria will be used in this class:
   • You are expected to attend all class sessions, except for unusual circumstances, and participate in class discussions.
   • You are expected to complete all assignments in a timely manner. You may work together on homework assignments, but not on the major class projects as noted above. The assignments are expected to be of a professional caliber (neat, well documented, and correct). Portions of a homework assignment may be collected on the day they are due. A complete package of all the homework assigned during the term (and corrected after class discussion) will be due at the end of the term. Students may be periodically called upon to present and discuss homework solutions to the class on the day the homework is due.
4. Special project assignments (including possible take-home exams) will be collected for grading during the term. Not all project assignments will have “correct” answers, nor will all needed information necessarily be given to you. You will probably be required to use the library and other sources to obtain needed information. Major assignments may at times seem vague, just as in the real world (not because your instructor is lazy or unorganized!).

Grading:
Approximate grading:
10% class participation, 15% homework, 15% research presentation, 60% project assignments. If you complete an assignment as given, and it is correct and presented in a professional manner, you will have done what is expected and will receive an above average grade. You will receive an “excellent” grade only for work of an outstanding caliber.