CEE 5460/6460: Water Resources Engineering -- Fall 2012

Class Time: Tuesdays and Thursdays 1:30 to 2:45 PM **Class Location:** ENGR 401
Class Website: http://www.engr.usu.edu/cee/faculty/derosenberg/cee5460.htm

Instructor: David Rosenberg
Offices: 213 ENGR / 205 UWRL
Office Hours: T/TH 4:15 – 5:15 PM in 213 ENGR, or by appointment
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Course Overview

Purpose: To acquaint senior- and MS-level engineering students with the planning, design, policy, and management practiced by water resources engineers in the private and public sectors.

Course Description: This engineering course is largely problem- and design based. We will focus on a few, select water resources topics, including: water demands, water conservation, rainfall and runoff, storm water management, hydropower generation, dredging, water law, and economic impacts of groundwater drawdown. Students will develop solutions to local, state, and regional water resources problems through individual and group work, discussion, and lecture.

Learning Objectives: Upon successfully completing the course, the student will:

a. Demonstrate critical analysis skills and capabilities expected of practicing water resources engineers, including to identify, evaluate, and recommend alternatives.
b. Coherently and concisely present engineering designs in oral, written, and web formats.
c. Recognize, describe, and adapt engineering designs to physical, economic, environmental, social, political, and other constraints that limit water resources engineering and management.
d. Complete water resources designs in a timely fashion providing and using peer feedback.
e. Work both individually and in a small team to solve water resources problems.
f. Apply public-domain water resources models to solve current water problems.
g. Identify cost effective water conservation actions for an individual residential household.
h. Propose, design, and contrast conventional and low-impact storm water management techniques for a new subdivision.
i. Compare the costs and yields of additional Bear River reservoir storage and pressurized secondary irrigation system.
j. Recommend aquifer storage and recovery sites within Cache County.

Pre-requisites: CEE 3430 Engineering Hydrology; CEE 3500 Fluid Mechanics; CEE 4200 Engineering Economics.

Texts: None. I will either post required readings electronically on the class website or distribute in class.

Approximate Grading (CEE 5460 students: 100%; CEE 6460 students: 105%)

Engineering Reports on 3 Individual Problem Based Learning (PBL) Design Opportunities – 60%
Class Participation – 10%
Facilitate a Class (FaC) – 5% (Graduate CEE 6460 students only)
Group PBL Design Opportunity
Draft wiki and peer review – 8%
Final wiki – 14% Oral presentation – 8%

CEE 5460 / 6460 Class Schedule (subject to change)

Date	Topic	Readings	Course Work
Aug 28	Course intro; Water resources problems		
30	Water uses and demand modeling	Linsley, ch 15; Mayer et al	
Sept 4	In-class discussion of PBL-1		
6	**No Class** (CI-WATER symposium)		
11	Value Landscape Engineering model use	VLE manual (vers. 1.5)	
13	Water conservation	Vickers; Inman	**PBL-1 part 1 due**
18	Engineering economics (recall + extension)	B/C Ratios paper	
20	Rational planning	Rational planning paper	**PBL-1 due**
25	Hydrology and precipitation	Linsley, ch. 5	**Peer Review due**
27	Rainfall-runoff	Bedient, pp. 119-134	**PBL-1 resubmit due**
Oct 2	In-class discussion of PBL-2		
4	SWMM model use	SWMM manual	
9	Low impact development design (Yang)	SWMM & LID manuals	
11	Storm water management + design	SWMM manual	**PBL-2 part 1 due**
16	Managing Cache County water		
18	**Friday schedule for Fall Break (No Class)**		**PBL-2 due**
23	Reservoir operations, yield, reliability analysis	Loucks, ch. 11.2.2	
25	In-class discussion of PBL-3		
30	HEC-ResSim model use	ResSim quick start guide	
Nov 1	HEC-ResSim model use (cont.)	ResSim manual	
6	Pressurized irrigation system design		
8	Sensitivity analysis	Loucks, ch. 9.4.2	
13	FaC: Conjunctive use	Coe paper	**PBL-3 due**
15	Spreading basins		
20	In-class discussion of PBL-4		
22	**Thanksgiving (No Class)**		
27	FaC: Utah water rights	Linsley, Ch. 6; Utah water law	**Draft Wiki due**
29	Class wrap-up		**Peer review due**
Dec 4	Guest lecture		
6	Group time		**Final Wiki due**
11	(1:30-3:20 pm) Group Oral Presentations		

Description of Required Course Work

Reports on Individual Problem-Based Learning (PBL) Design Opportunities
Students will submit three (3) individual designs in the format of short engineering reports. The reports will concisely showcase original student work on existing water resources problems of pressing local or state interest. Each report will have a maximum of two pages, single spaced, 1-inch margins and 12-point font, not including references and appendices. These design opportunities are open-ended problems with multiple correct answers. Work will be judged on the design plausibility, methods used to develop the design, analysis of the financial, economic, and other impacts of the design, and presentation of all the above in a 2-page report. **These PBL design opportunities will challenge your engineering capabilities and will likely constitute the most difficult and involved work you will undertake in your undergraduate engineering career.** For each PBL, expect to develop and apply skills such as spreadsheet design and layout, uncertainty analysis, sensitivity analysis, cost estimation, data regressions, and data interpretation. You will need to make, document, and justify many assumptions. You will need to recall and extend these skills from prior classes; we may only briefly review them in lectures.

To be successful with the PBL designs and reports you must:

- Exercise time management; you are given at least three weeks for each PBL because it takes this long to do it well.
- Make sure to address all the requested engineering design points and analysis.
- Demonstrate concise and logical writing skills; you only fully understand a topic when you can explain yourself clearly and succinctly.
- Follow the guidelines in the documentation available on the course website:
    1. Grading Rubric for PBL reports
    2. Guidelines for Writing PBL Reports
    3. PBL hints

For each PBL, students will also have in-class time to discuss the PBL in small groups. Students can use ideas, methods and procedures discussed within groups to develop and prepare their reports; however, the report must be written individually, results calculated independently, and all references reported appropriately.

The PBL design opportunities are:

PBL-1. Household water conservation (individual)
PBL-2. Storm water design for a new community development in Logan (individual)
PBL-3. New reservoir or pressurized secondary irrigation system for Cache County (individual)

Students not satisfied with their performance on any or all of the individual PBL reports may revise and resubmit a report by the resubmit date listed on the class webpage. When revising, include a cover letter that describes changes made in response to instructor and peer feedback.

Class Participation
Students should read assigned readings ahead of time and come to class prepared to share their impressions of the reading(s) and/or ask questions on unclear points. During class, I will also often pose questions to the class and ask an individual to respond. When asked, I expect you to

provide your best answer. As a practicing engineer, your boss, co-workers, clients, regulators and others will ask questions about your work or solicit your advice. Answering questions in class will help you develop this professional skill.

I sometimes use the Socratic questioning method during class and office hours. What is the Socratic method? I respond to a student question with one or more questions. Why? My follow-up questions allow me to (i) better understand what motivated the original question, (ii) ascertain what you already understand, and (iii) spur thinking in a direction and towards an intermediary step that I think will help you to answer your own question. I realize that, at first, this method can seem frustrating. Bu my intent is to promote active learning and a lifetime of discovery.

The same expectations of class participation above also hold when CEE 6460 students facilitate and lead discussion for a class period (see FaC below).

Several class periods will also involve in-class group participation to discuss the PBL design opportunities. These discussions will be problem-solving and method developing sessions and opportunities. I will randomly assign 3 or 4 students to a group. One individual from each group should document the group process/methods/solutions/etc and be prepared at the end of the class period to informally report on their group's discussion to the entire class. Students should also complete and turn in peer assessment forms at the end of the class period.

Facilitate a Class (FaC; Graduate CEE 6460 Students Only)
Small teams of graduate students (2 to 3) will facilitate a class (FaC) on the assigned reading. I will facilitate two discussions early in the semester to demonstrate. Later, I will assign or seek volunteers for remaining FaC topics.

When facilitating a class, make sure to thoroughly read the assigned reading (often several times) and establish the key learning objectives you want each student to achieve by the class end. Then, meet with me to confirm the appropriateness of the learning objectives. Finally, develop a class plan so each student can achieve the objectives. Plans should engage students with activities that reach multiple learning styles (such as auditory, visual, social, reflective, global, sequential, etc.). Additionally, be ready to answer student questions and solicit class discussion.

Group PBL
Each student will also complete a fourth PBL as a member of a group. Each group will select an aquifer storage and recovery (ASR) site in Cache Valley, compare the cost and yield of the site to alternative options evaluated in PBL-3, and apply for a new (or amended) Utah Water Right for the recommended option. I will assign group members and the group will submit a short summary of their work in the form of a Wiki. Groups will also make a final oral presentation.

Draft Wiki
Each group will prepare and maintain a wiki of their ASR evaluation work for PBL-4. Wikis will be hosted on the USU College of Engineering wiki at http://www.engr.usu.edu/wiki/index.php/CEE5460/6460_Water_Resources_Engineering_Projects. Presenting work in this format will help facilitate communication among group members, develop skills in this emerging communication medium, and make group work and results available to the rest of the class, future classes, and others. The Wiki grading rubric lists special considerations to present information in the Wiki format.

Peer Review
Each student will read a draft wiki authored by another group and provide constructive feedback (peer review) using the form available on the class webpage.

Final Wiki Report
Groups can and should use peer review and feedback to revise their draft Wikis and prepare a final version of their Wiki.

Oral Presentation
Each group will also give a short, technical oral presentation to the class on their PBL-4 work. Presentations should include visual and/or auditory aids (as necessary) to support a variety of learning styles. We will determine the allotted time for presentations and questions once we determine the number of groups. A guideline for preparing and giving technical presentations is available here. The instructor and each student will provide constructive feedback to each presenter using a feedback sheet available on the course website.

Grading of and Expectations for Submitted Work

Required course work will be graded according to the grading rubric for each work item. Work will be weighted roughly by the percentages listed on page 1 to determine the final course grade.

90 to 100% -- at least some sort of A
80 to 90% -- at least some sort of B
70 to 80% -- at least some sort of C
< 70% -- most probably some sort of F

There will be no curve, so all work that meets "A" standards will earn an "A".

All submitted work will be graded for technical correctness, clarity, organization, presentation, and other criteria **according to the standards laid out in the grading rubric posted on the class webpage** for each work item. A grading rubric for the PBL-1 is included with the problem description. If submitted work is substantially below standards, I will ask to meet with the student and discuss ways to work towards improvement.

All work must be original, typed with 1" margins in a standard font, printed, stapled, and handed in at the **beginning** of class on the due date listed on the syllabus. In addition, complete the self-assessment portion of the grading rubric, print it out, and turn it in with the work item. Finally, turn in an electronic copy, all supporting spreadsheets or electronic files, and the self assessment via Canvas. Late work will not be accepted and will be graded as zero. In extenuating circumstances (birth/death in the immediate family; grave illness with doctor's note), you must contact me **prior** to the due date and make alternative arrangements to submit work.

Submitted work should be considered a professional communication from the student to the instructor. Include a title page with the student's name, date, email address, subject title, class, and instructor name.

Academic Integrity: I expect each student to uphold their USU Honor Pledge. Also, plagiarism is an offense that USU, the CEE department, and I take seriously. Plagiarism will result in prosecuting offending parties to the full extent of the USU Code. It is easier to get caught than you think. When in doubt, acknowledge sources, cite references, and quote material.

Expectations of Students

- Be on-time to class and ready to learn / participate when class starts.
- Turn off or keep silent all electronic devices (phones, pagers, PDAs, music players, etc.) that may make a noise or otherwise distract other students or me. I will ask students using such devices to leave the class for the remainder of the class period.
- Participate and contribute to class discussions and small group work.
- Be respectful of and listen to other's points of view during discussions.
- Turn in all work on time in the required formats.
- Bring questions and concerns forward either during class, office hours, or by email (make sure to include **"CEE 5460"** or **"CEE 6460"** in the subject line of all emails related to the class so that I can attend and respond to emails in a timely manner).

Expectations of the Instructor

- Be on-time to class and prepared to give lectures and/or facilitate discussions.
- Call equally on all students for class participation.
- Learn student names by some point through the semester.
- Facilitate an environment of inclusivity and non-discrimination.
- Respond to student email within 30-hours when I am not otherwise traveling out of town.
- Return graded work back to students within 1 week from when submitted.
- Wake students who are sleeping and ask them to either (i) participate, or (ii) leave class.

Disability/Special Accommodations

If you have a disability or otherwise require special accommodations, please talk to me immediately.

Additional Resources for Students

- List of web sites discussing water conservation, water conservation programs, and water conservation technologies (http://www.engr.usu.edu/cee/faculty/derosenberg/links.htm)
- Class web page: http://www.engr.usu.edu/cee/faculty/derosenberg/cee5460.htm
- Instructor's web page: http://www.engr.usu.edu/cee/faculty/derosenberg/

Please address further questions or concerns about the contents in this syllabus or the course to the Instructor by email or in person

ABET Outcome Assessment

Students who successfully complete the course will gain the:

Outcome	PBLs	Team Work	Facilitate a Class	Oral Presentation	Wiki Report
(a) ability to apply knowledge of mathematics, science, and engineering principles to civil engineering problems	Objs. A, B, C, D, E, F, G, H, I, J	Objs. B, D, E, F, G, H		Objs. A, B, C, J	Objs. A, B, C, J
(b) ability to design and conduct experiments, as well as to analyze and interpret data	Objs. A, B, F, G, H, I, J	Objs. B, F, G, H		Objs. A, B, J	Objs. A, B, J
(c) ability to design a system, component, or process to meet desired goals in civil engineering applications	Obj. A, G, H, I	Obj. F, G, H		Objs. A, J	Obj. A, J.
(d) ability to function on multi-disciplinary teams		Obj. E	Obj. E	Obj. E	Obj. E
(e) ability to identify, formulate, and solve engineering problems	Objs. A, B, C, D, G - J	Objs. A, B, C, D, F, G, H		Objs. A, B, D	Objs. A, B, D
(f) understanding of professional and ethnical responsibility					
(g) ability to communicate effectively	Obj. B	Obj. A	Obj. I	Obj. B	Obj. B
(h) broad education necessary to understand the impact of engineering solutions in a global and societal context	Objs. A and C	Objs. A and C	Obj. C	Objs. A and C	Objs. A, C,
(i) recognition of the need for, and an ability to engage in life-long learning.	Obj. D		Obj. D		Obj. D
(j) knowledge of contemporary issues in civil engineering					Obj. J
(k) ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	Objs. A, B, F, G, H, I, J			Objs. A, J	Objs. A, J
(l) understanding and application of engineering knowledge of specialized areas in Civil Engineering	Objs. A, C, F, G, H, I, J	Objs. A, C, F, G, and H		Obj. J	Obj. J
(m) understanding of basic project management techniques and leadership	Obj. D			Obj. D	Obj. D
(n) understanding of basic professional practices including work procurement, and legal issues				Obj. J	Obj. J

Importance of IDEA Course Objectives

(to help students rate the course at the semester end)

IDEA Course Objective	Minor/No Importance	Important	Essential
1. Gaining factual knowledge (terminology, classifications, methods, trends)	XX		
2. Learning fundamental principles, generalizations, and theories	XX		
3. Learning to apply course material (to improve thinking, problem solving, and decisions)			XX
4. Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course			XX
5. Acquiring skills in working with others as a member of a team		XX	
6. Developing creative capacities (writing, inventing, designing, performing in art, music, drama, etc.)		XX	
7. Gaining a broader understanding and appreciation of intellectual/cultural activity (music, science, literature, etc.)	XX		
8. Developing skill in expressing myself orally or in writing			XX
9. Learning how to find and use resources for answering questions or solving problems		XX	
10. Developing a clearer understanding of, and commitment to, personal values	XX		
11. Learning to analyze and critically evaluate ideas, arguments, and points of view			XX
12. Acquiring an interest in learning more by asking my own questions and seeking answers		XX	