CE 431/511 - Design of Water & Wastewater Systems I [Spring 2016]

http://www.webs1.uidaho.edu/ce431/

CATALOG DESCRIPTION: Application of fundamental engineering science to the design of systems for the treatment of domestic and industrial water supplies; treatment and re-use of domestic sewage and industrial wastes. Additional projects/assignments required for graduate credit.

PREREQUISITES: CE 322, CE 330, ENGR 335

REQUIRED TEXTS: Wastewater Engineering: Treatment and Resource Recovery, Metcalf & Eddy, 5th ed., McGraw-Hill, ISBN-10: 0073401188; ISBN-13: 978-0073401188

INSTRUCTOR: Erik R. Coats, P.E., Ph.D.
BEL 129; 208.885.7559
ecoats@uidaho.edu

TIME AND PLACE: 2:30-3:20 MWF; JEB21

OFFICE HOURS: 3:30-4:30 M-Th, and by appointment

COURSE OBJECTIVES & STUDENT LEARNING OUTCOMES: CE 431 is a course on the fundamental design of water and wastewater systems. Students will learn current and emerging practices and procedures for the planning, design, and operation of water and wastewater facilities. Emphasis will be placed on integrating individual unit operations and processes to achieve overall treatment objectives and to satisfy given constraints. Upon successful completion of this course (as defined below under **ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES**), you should be able to:

1. Understand and identify the most critical issues and challenges in planning, designing, and operating water and wastewater treatment facilities to meet not only current but anticipated future regulatory requirements.
2. Develop design criteria (e.g., mass and flow inputs; performance requirements; general bulk/aggregate physical, chemical, biochemical, and biological kinetic and stoichiometric parameters) necessary for the preparation of preliminary designs for water and wastewater treatment unit operations and processes.
3. Understand and organize all the major unit operations and unit processes associated with water and wastewater treatment into a complete treatment train.
4. Analyze sanitary sewer collection and influent, preliminary, primary, and secondary water and wastewater treatment components and systems.
5. Complete basic preliminary designs for sanitary sewer collection and influent, preliminary, primary, and secondary water and wastewater treatment unit operations and processes.

Note that the phrase 'successful completion' intrinsically involves a commitment by the student to immerse into the course material and independently seek a preliminary mastery of the subject. Attending lectures alone is only part of your journey toward mastery.

An important philosophy I want you to apply to your learning in this class is to immerse yourself into the material such that you **LEARN** the material and **DO NOT MEMORIZE** the material. In the long term you will realize significant benefits by embracing this approach, both in your continued education and as practicing engineers.

One last point: spelling, grammar, sentence construction, and overall communications skills are vital for success in engineering. Therefore, these will be considered in my grading of your work. Proficiency or lack thereof could easily (read: will) be a difference in your final letter grade.

CE 431/511 - Design of Water & Wastewater Systems I [Spring 2016]

http://www.webs1.uidaho.edu/ce431/

TOPICS COVERED:

1. Water and wastewater system planning.
2. Sanitary sewer collection system design.
3. Influent, preliminary, and primary water/wastewater treatment systems.
   a. Pumping stations
   b. Grit removal systems
   c. Flow metering
   d. Primary clarification
4. Activated sludge systems (BOD_5 and NH_4 removal).
5. Aeration systems.
6. Facultative and aerated lagoons.
7. Chlorine and UV disinfection techniques.
8. Sand filtration.

COURSE PROFILE: Three semester credits. Three 50 minute lectures per week.

Reading: You are expected to review class handouts and read assigned textbook sections in advance of each lecture, such that you can actively engage in discussion during class (in fact, we will have the occasional quiz on reading material that will also fold into lecture). Furthermore, not all material in the assigned reading will be covered in class; however, you are still responsible for said material.

Homework: Homework problems will be regularly assigned (plan on bi-weekly); solutions will be e-mailed. Homework problems will generally be from your textbook, although other sources will also be used. Quizzes will be periodically written and will principally (but not exclusively) be based on the assigned homework (in other words, lecture material is fair game, too).

Design Projects: You will complete multiple design projects during the semester. The projects will be real-world based, so much so that (1) they would seem to be approached in an arbitrary and sometimes incomprehensible manner, (2) you are provided with too little or too much basic data, and (3) you are required to make assumptions which should be based on designer experience. You may argue that you do not have any such experience, hence the reason you are taking this course. This course, however, will be structured such that you will begin to develop these necessary skills. If you intend to remain in engineering after graduation, you will doubtless spend much/most/all of your professional life solving problems for which too little or too much data are given, and making assumptions with little to base them on except experience.

Design projects will be completed in randomly selected teams (on-campus undergraduates); EO students will complete these projects in teams as well. The design projects in this course will also demand that you use MathCAD or similar software; note that Microsoft Excel is NOT considered "similar software."

Place your completed work at the front desk before each class starts on the day design problems are due. Unexcused late work will not be accepted.

Examinations: You will write three exams during the semester – two during the regular semester (50 minutes in length) and the final exam (120 minutes in length). Each exam will be comprehensive on the material covered since the prior exam. Examination material will include any/all material covered in class, any/all material from the assigned readings, and all material pertaining to the homework/design problems. A student may reschedule an exam if said student has three exams scheduled on the same day. For the graduate students, the exams will include additional problems beyond those assigned to the undergraduates.

Report: You will write a report on a peer-reviewed journal article (graduate students will write more than one report). We will discuss this element in more detail in class.

Class Attendance and Participation: Class attendance and participation should be one of your higher priorities this term. Some of the material covered during lectures will not be in your text or readings, although you will be responsible for it whether you choose to come to class or not. Failure to consistently attend class may reflect negatively in your final grade.

Quizzes. You may also have some occasional unannounced quizzes.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES: The primary method of assessing your progress and earning your grade will be through design problems (30%), exams (3@20%=60%), and report (5%). The remaining 5% of the grade will be assigned based on class participation, quizzes, homework, and attendance, and is at the instructor's discretion. Homework will not be graded.

- **The penalty for cheating is failure of the course.**
- Penalty for missing an exam without prior approval of excuse - 0.0 - unless there are (serious) mitigating circumstances.

GRADING SCALE:

90% ≤ A

80% ≤ B < 90%

70% ≤ C < 80%

65% ≤ D < 70%

F < 65%

KEY DATES: Important dates are as follows.

Exam 1: tentatively scheduled for Friday, February 19.

Exam 2: tentatively scheduled for Friday, March 25.

Final Exam (Exam 3): Friday, May 13, 12:30-2:30. No exceptions will be made to the University-scheduled time and date for the Final Exam (unless you have three or more exams scheduled for that day, and you must request in advance that your exam day/time be rescheduled).

No-class Days: Monday, January 18 (MLK day); Monday, February 15 (President's day); March 14-18 (spring recess). I will also be gone on the following dates: Friday February 5 and Friday April 22. I may have other travel requirements arise during the semester, and you will be notified accordingly. On my absences, I may have a guest lecturer in my stead. Alternately, I may pre-tape lectures for your viewing pleasure during the regularly scheduled class time.

Each student should also be familiar with the University dates regarding class withdrawal, etc.

PROFESSIONAL COMPONENT: This course contributes primarily to the students' knowledge of engineering topics and also provides design experience. More specifically, this course integrates concepts of environmental engineering and hydraulics into the design of water and wastewater treatment facilities. Emphasis will be given to the design of basic treatment plant unit process and unit operations, along with the management of design projects and preliminary design studies. Economic analyses, which are an integral component in a design course, are addressed through the evaluation of various alternative treatment mechanisms and technologies.

CLASS WEB PAGE: The URL for our class web page is listed at the top of this syllabus. I will utilize this web page to post various course information/data.

DISABILITY SUPPORT SERVICES-REASONABLE ACCOMMODATIONS STATEMENT: Reasonable accommodations are available for students who have documented temporary or permanent disabilities. All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 306 in order to notify your instructor(s) as soon as possible regarding accommodation(s) needed for the course.

EO STUDENTS: Engineering Outreach students should be aware of two issues:

1. The activated sludge WWTP design project in this course will demand use of MathCAD or similar software to complete. Microsoft Excel will be an insufficient tool in completing this part of the design project.
2. This is not a self-paced course and I will follow the UI policy for incompletes and posting final grades (see the EO policies and UI General Catalog for more information). While I will be as flexible as possible in accommodating your needs, it is your responsibility to complete and submit all assignments in a timely manner.

University of Idaho Classroom Learning Civility Clause. In any environment in which people gather to learn, it is essential that all members feel as free and safe as possible in their participation. To this end, it is expected that everyone in this course will be treated with mutual respect and civility, with an understanding that all of us (students, instructors, professors, guests, and teaching assistants) will be respectful and civil to one another in discussion, in action, in teaching, and in learning.

Should you feel our classroom interactions do not reflect an environment of civility and respect, you are encouraged to meet with me during office hours to discuss your concern. Additional resources for expression of concern or requesting support include the Dean of Students office and staff (5-6757), the UI Counseling & Testing Center's confidential services (5-6716), or the UI Office of Human Rights, Access, & Inclusion (5-4285).

Prepared by: Erik R. Coats, January 2016. This syllabus is subject to change in the event of extenuating circumstances, or by mutual agreement between the instructor and students.