

CE 432/532 - Design of Water & Wastewater Systems II [Fall 2016]

<http://www.webpages.uidaho.edu/ce432/>

CATALOG DESCRIPTION: Application of unit operations and processes to the design of integrated wastewater treatment plants; critical analysis of existing designs. Additional projects/assignments required for graduate credit.

PREREQUISITES: CE 431, or instructor permission

REQUIRED TEXT: 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.
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TIME AND PLACE: 10:30-11:20 MWF (JEB 25; and via Engr. Outreach)

OFFICE HOURS: 4-5 MTuWTh, and by appointment

COURSE OBJECTIVES & STUDENT LEARNING OUTCOMES: This course educates environmental engineers on the current/anticipated future practices for the design, process trouble-shooting, and operation of advanced water/wastewater treatment 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, you should be able to:

1. Develop design/operational criteria (e.g., mass/flow inputs; performance requirements; general bulk/aggregate physical, chemical, biochemical, and biological kinetic and stoichiometric parameters) for advanced water/wastewater unit operations/processes.
2. Analyze secondary/tertiary water and wastewater treatment components and systems to determine overall process and individual unit effectiveness.
3. Troubleshoot process "failures."
4. Complete basic designs for secondary/tertiary water and wastewater treatment unit operations and processes, including system layout and specification of equipment.

An important philosophy I want you to embrace in this class is to immerse yourself into the material such that you **UNDERSTAND THE FUNDAMENTALS** rather than simply commit material to short-term memory. In the long term you will realize significant benefits by embracing this approach, both in your continued education and as practicing engineers. And one last point: spelling, grammar, sentence construction, and overall communications skills are vital areas for success in engineering. Therefore, these will be considered in my grading of your work. Proficiency, or lack thereof, could easily be the difference in a final letter grade.

TOPICS COVERED (may be modified and/or supplemented):

1. Bacterial metabolisms, growth, energetics, kinetics – as related to biological processes employed in the treatment of wastewater and recovery of resources from wastewater.
2. Suspended growth Biological Nutrient Removal (denitrification and phosphorus removal)
3. Chemical phosphorus removal – including coagulation & flocculation principles
4. Fixed film Biological Nutrient Removal (nitrification) – Fixed Film Systems
5. Sand Filtration/Membrane Filtration/Water Reuse
6. Sludge handling, Biosolids digestion (time allowing)
7. Biosolids Dewatering & Use/Residuals Mgt (time allowing)
8. Odor Control (time allowing)

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

Reading: Reading assignments will generally be assigned in advance of lecture. You are expected to review class handouts and read assigned textbook sections/journal articles in advance of each lecture. Furthermore, not all material in the assigned reading will be covered in class; however, you are still responsible for said material.

Report: Undergraduate students will write a brief report on a peer-reviewed journal article. Graduate students will complete two reviews. We will discuss this in more detail in class.

Homework: Homework problems will be regularly assigned (plan on weekly); solutions will be e-mailed. Homework problems will generally be from your textbook, although other sources may 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 and Analysis Projects: You will complete multiple design and analysis projects during the semester. 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 experience. You may then argue that you do not have any experience, hence the reason you are taking this course. This course, however, will be structured such that you will begin to develop and refine these skills. If you intend to remain in engineering, 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 fundamental knowledge and experience. Design projects will be completed in instructor-assigned teams.

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.

Class Attendance and Participation: Some of the material covered during lectures will not be in your text or readings, although you will be responsible for it whether you come to class or not.

Class attendance and participation should be one of your higher priorities this term.

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ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES: The primary method of assessing your progress and earning your grade will be through design/analysis projects (30%), exams (3@20% each), and report (5%). The remaining 5% of the grade will be assigned based on class participation, homework, quizzes, and attendance, and is entirely at the instructor's discretion. While homework will not be graded, I will keep a record of your homework completed. Also, I will regularly check to confirm that sufficient effort was committed to complete the homework.

- **The penalty for cheating is failure of the course.** Students are directed to the following web site for more information:
<http://www.uidaho.edu/DOS/judicialaffairs/studentcodeofconduct>
- Penalty for missing an exam or quiz without prior approval of excuse - 0.0 - unless there are (serious) mitigating circumstances.

GRADING SCALE: Successful completion of this course, and your earned grade, will be determined according to the following scale:

90% ≤ A

80% ≤ B < 90%

70% ≤ C < 80%

65% ≤ D < 70%

F < 65%

One last point: spelling, grammar, sentence construction, and overall communication skills are vital areas for success in engineering. Therefore, these will be considered in grading. Proficiency, or lack thereof, could easily be the difference in a final letter grade.

PROFESSIONAL COMPONENT: This course contributes primarily to the students' knowledge of engineering topics and 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.

KEY DATES: Important dates are as follows.

Exam 1: tentatively scheduled for September 26th. However, this date is subject to change.

Exam 2: tentatively scheduled for October 31st. However, this date is subject to change.

Exam 3: Thursday, December 15th, 10-12AM. 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, do not ask to reschedule the exam.

No-class Days: August 26th; September 5th (Labor Day); September 26-28; October 17-19; November 21-25 (Thanksgiving break). Dates in **bold** – I will be at meetings/conferences – I will pre-tape some of these classes for student viewing during the regular class period, or otherwise schedule extra sessions so that minimal lecture time is cancelled.

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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 material pertinent to the course.

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