

University of Colorado Denver
College of Engineering, Design, and Computing
CVEN-4426/5426 Pipe Network and Sewer Design

Spring 2023

Class: Mon/Wed 2:00-3:15 pm

Location: Plaza Building 112

Office Hours: Mon/Wed 3:30-4:45 pm,
in Plaza Building M-206, *and by appointment*

Instructor: David C. Mays, P.E., Ph.D.

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<http://engineering.ucdenver.edu/dmays/4426>

Catalog Description: Design of pressurized pipe networks for water supply and sanitary sewers for wastewater collection. Topics include the civil engineering design process, estimation of water and wastewater design loads, and design of pressurized pipe networks and sanitary sewers including pump selection, service reservoirs, lift stations, and relevant software. Design project and field trip required. *Prerequisite:* CVEN-3313 Fluid Mechanics (or equivalent).

Course Objectives: At the end of the semester, you should be able to:

1. Define, understand, and apply the civil engineering design process.
2. Estimate water demand and sewage flows based on population, land use, and other factors.
3. Design the key elements of a water supply system, including pipe network design, pipe sizing, treated water storage reservoirs, and other appurtenances with appropriate cost estimates.
4. Design the key elements of a wastewater removal system, including sewer network design, sewer sizing, pipe bedding, and other appurtenances with appropriate cost estimates.
5. Apply hydraulic design software such as EPANET and SWMM.
6. *For CVEN-5426:* Perform analysis, modeling, and reflection on the refereed literature.

Required Text: Shammass, N.K. and Wang, L.K. (2021), *Pipe Networks and Sewers*, ISBN 9781394187096. Custom textbook at Tivoli Station Bookstore. Hard copy required for exams.

Week	Dates	Lecture Topic(s)	Textbook Section(s)
1	1/18	Civil engineering design process.	Hubly (1998) Chapter 2
2	1/23, 1/25	Introduction to water systems.	1.0-1.11, 4.0-4.5, 4.9, 6.8
3	1/30, 2/1	Water software (EPANET).	7.0-7.7
4	2/6, 2/8	Tanks and pumps.	8.0-8.7
5	2/13, 2/15	Water hydraulics.	5.0-5.5
6	2/20, 2/22	Water system design I.	6.0-6.7, 9.0—9.6
7	2/27, 3/1	Water system design II.	<i>same as Week 6</i>
8	3/6, 3/8	Introduction to wastewater systems.	4.6-4.8, 10.0-10.3, 10.7-10.10, 14.16
9	3/13, 3/15	Review. Midterm exam.	Chapters 1, 4-9
10	3/27, 3/29	Wastewater software (SWMM)	Rossman (2015) and Lowe (2009)
11	4/3, 4/5	Wastewater hydraulics.	13.0—13.9
12	4/10, 4/12	Wastewater system design I.	14.0-14.2, 14.4.2, 14.6-14.9, 14.14-14.15
13	4/17, 4/19	Wastewater system design II.	<i>same as Week 12</i>
14	4/24, 4/26	Wastewater system appurtenances.	16.0—16.15
15	5/1, 5/3	Review. Project presentations.	Chapters 4, 10, 13-16

Midterm Exam: Wednesday 3/15/2023 (weeks 1-7).

Final Exam: To be scheduled during exam week 8-12 May 2023.

Grades: 25% midterm, 25% final exam, 25% project, 20% homework, 5% participation.

Undergraduate/Graduate

This course is cross-listed with an undergraduate and graduate versions CVEN-4426 and CVEN-5426, respectively. The two versions have much in common, so a student may not earn credit for both versions taken in different semesters. There are two differences. First, to address the additional course objective to “perform analysis, modeling, and reflection on the refereed literature,” students taking the graduate version will have at least one additional question on each homework assignment. Second, except for the design project, students in the undergraduate and graduate versions will be graded separately.

Design Project

Designs of a water supply system and a wastewater removal system are a major part of this course. The design process will be accomplished by teams of students, giving you the experience working on a *design team*. The design will be summarized in a single report submitted by each team; each student will receive the grade assigned to their team's report. Guidelines and evaluation criteria will be provided.

Field Trip

A required field trip will be scheduled in the first half of the semester. We will visit a local community to review their water supply system, including a water treatment plant, which will serve as a basis for our design project. Many past students have considered this field trip to be a highlight of the course.

Homework

Homework will be assigned in class each Monday or through the Assignments and Answers link on the course website, and will be due in class Wednesday of the next week. Engineering paper is strongly encouraged but not required. To clarify the presentation, accelerate the grading, and develop attention to detail, homework must comply with the following specifications:

1. At the top of *each* page, print your name, class number, homework number, due date, and page of total (1 of 5, 2 of 5, etc.). Submitting late? OK, but write the date submitted on the first page.
2. Draw a picture for *each* problem. Use a straight edge for straight lines.
3. Briefly restate *each* problem in your own words. Do not copy the problem statement verbatim.
4. State what you are going to calculate under heading FIND.
5. State any relevant assumptions, including assumed precision of input numbers.
6. Write the units for all numbers, not just final results:
 - a. Use the same units (metric or US) as the problem.
 - b. Write 5 ft rather than 5' and 8 in rather than 8".
 - c. Units like psi are fine for results, but otherwise write lb/in² to show unit cancellation.
7. Write each result, with the correct number of significant digits, on its own line.

Homework grades are A (100%), B (85%), C (75%), D (65%), and F (0%). Homework will be graded for presentation, approach, correctness, and compliance with the specifications.

- Life happens, so late homework is accepted—no questions asked—with a penalty of one letter grade per class.
- There is also a one letter grade penalty for each of the following: (1) Late homework not stating the date submitted. (2) Missing upper-left staple. (3) Ragged edges or wrinkled paper.
- No credit for late assignments after solutions have been posted online.
- Unclaimed exams, assignments, and reports will be destroyed on or after 6/1/2023.

Participation

Rationale for participation grade: Learning is an activity that we perform (like dancing, fixing cars, or skiing) rather than a commodity that we purchase. I will attempt to call on each of you each week, and I

expect you to reply every time. Why? Because you are training to become a professional, who will be called upon to speak up and answer technical questions. People will expect you to be prepared, so you should complete the reading assignment before class. Your participation grade will be determined by ratings provided by your design project teammates.

Communication

I expect you to check your official university e-mail account each and every business day, or forward your e-mail to another account you check each and every business day. For details, see the university website.¹

Academic Integrity

Studying with others is useful and encouraged, but you must perform and present your own work, so copied solutions—from an online resource, from a paid tutor, from other students, or from any other source—violate the expectation for academic integrity stated in the *2022-2023 Undergraduate Catalog* or *2022-2023 Graduate Catalog*, including the Academic Integrity and Discipline Policies,² and the Student Honor Code for the College of Engineering, Design and Computing. Midterm and final exams will follow an Exam Policy to be distributed separately. Finally, to avoid plagiarism, cite your sources using American Society of Civil Engineers format.³

Mental Health

Is your mental well-being impacted by anxiety, depression, substance use, or loneliness? If so, you are not alone. There is help through Single Stop,⁴ your one-stop-shop for all student support services. You can visit their website below, e-mail them at singlestop@ucdenver.edu, call them at 303-315-WELL, or visit them on the 3rd floor of the Salazar Student Wellness Center (1355 12th Street).

General

- Snow Closure Hotline 877-556-3637.
- Need accommodations for homework or exams? Please register with Disability Resources and Services (DRS),⁵ who will evaluate your situation on a case-by-case basis. I am always more than happy to provide accommodations per your letter from DRS.
- Missed exams will receive an F, except (a) when special arrangements have been made with me ahead of time, or (b) with documentation of an emergency.
- Grades will not include plus or minus designations.
- Syllabus subject to revision.
- Students are responsible for all material presented in class, readings, homework, and e-mail.
- We honor and acknowledge that we are on the traditional territories and ancestral homelands of the Cheyenne, Arapaho, and Ute nations.

Finally, this semester's Academic Calendar and our Student Honor Code are attached below. If you have not done so already, please print, sign, and scan the Student Honor Code and e-mail back to me.

Welcome to the class!

¹ <http://www.ucdenver.edu/email/>

² <http://catalog.ucdenver.edu/>

³ <http://ascelibrary.org/doi/pdf/10.1061/9780784478998.ch17>

⁴ <https://www.ucdenver.edu/wellness/services/basic-needs/single-stop>

⁵ <https://www.ucdenver.edu/offices/disability-resources-and-services>

All deadlines are 11:59 PM MT unless otherwise indicated.

Main Session	Date	Important Notes
First day to apply for Spring Graduation via UCDAccess.	November 1, 2022	
Registration begins for Spring Semester via UCDAccess.	Nov. 1, 2022 - Nov. 16, 2022	Check UCDAccess for your specific registration date and time assignment. For best course selection, register as soon as possible after your registration time assignment.
Open enrollment begins.	November 17, 2022	
Martin Luther King Jr. Holiday	January 16, 2023	No classes. Campus open.
First day of Spring semester classes.	January 17, 2023	
Last day to waitlist classes using UCDAccess.	January 22, 2023	
Last day to drop a class without a \$100 drop charge.	January 23, 2023	All waitlists will be eliminated today.
First day instructor approval may be required to add some classes.	January 23, 2023	If unable to enroll in UCDAccess because "Instructor Consent is Required", obtain instructor approval on a Schedule Adjustment Form.
Census	February 1, 2023	
Last Day to add classes in UCDAccess.	February 1, 2023	
Last day to add classes with instructor consent on the Schedule Adjustment form.	February 1, 2023	If unable to enroll in UCDAccess because "Instructor Consent is Required", obtain instructor approval on a Schedule Adjustment Form.
Last day to drop classes with a financial adjustment.	February 1, 2023	
Classes dropped after this date will appear on your transcript with a grade of "W".	February 1, 2023	
Full tuition will be charged for additional classes added after this date.	February 1, 2023	College Opportunity Fund hours will not be deducted from eligible student's lifetime hours.
Last day to apply for Spring graduation via UCDAccess.	February 1, 2023	After this date, contact your advisor.
Last day to request or cancel Grade Forgiveness.	February 1, 2023	Refer to the Grade Forgiveness form for restrictions.

Last Updated 1/26/2021

Registration begins for Summer Semester via UCDAccess.	March 1, 2023	Check UCDAccess for your specific registration date and time assignment. For best course selection, register as soon as possible after your registration time assignment.
Open enrollment begins for Summer Semester.	March 17, 2023	
Spring Break	March 19, 2023 - March 25, 2023	No classes. Campus open.
Last day to withdraw from a class via UCDAccess.	April 2, 2023	
Last day to request No Credit or Pass/Fail grade for a class.	April 2, 2023	Graduate degree students can exercise the P/F option for undergraduate courses only. Graduate students should consult their school or college regarding the P/F option. A grade of P will not be acceptable for graduate credit to satisfy any Graduate School requirement.
Registration begins for Fall Semester via UCDAccess.	April 3, 2023	Check UCDAccess for your specific registration date and time assignment. For best course selection, register as soon as possible after your registration time assignment.
First day to withdraw from a class with a Late Withdraw Petition form.	April 3, 2023	
Open enrollment begins for Fall Semester.	April 19, 2023	
Last day to withdraw from a class with a Late Withdraw Petition form.	May 3, 2023	
Finals week.	May 8, 2023 - May 13, 2023	
End of semester - Commencement.	May 13, 2023	
Final grades available on UCDAccess and transcripts (tentative).	May 18, 2023	
Spring degrees posted on UCDAccess and transcripts (tentative).	June 20, 2023	This is the date your degree will be recorded on your transcript; diplomas begin mailing on July 7th.

Important Information

Refer to the Residency website for important deadlines pertaining to In-State Tuition Rate qualification.

Refer to the College Opportunity Fund (COF) website for important deadlines pertaining to the COF stipend for eligible

Last Updated 1/26/2021

Student Honor Code

(Revised 12/1/2022)

The Honor Code outlined below is the College of Engineering, Design and Computing statement on academic integrity. The Code articulates the College's expectations of its students and faculty in establishing and maintaining the highest standards in academic work.

Honor Code Text

The Honor Code of the College of Engineering, Design and Computing is a statement of its students, individually and collectively:

- Students will not give or receive aid during examinations.
- Students will not use any prohibited electronic devices during examinations.
- Students will not give or receive unpermitted aid in class work, in the preparation of reports, or in any other work that is to be used by the instructor as the basis of grading.
- Students will uphold the spirit and letter of the Honor Code and they will take an active role to ensure that others uphold the Honor Code and if they observe violations of the Honor Code they must report violations to their Department Chair.
- The Faculty of the College will do its part to ensure its confidence in the honor of its students. Faculty must ensure that precautions are in place to prevent the forms of dishonesty mentioned above. Faculty will also avoid, as far as practical, academic procedures that create temptations to violate the Honor Code. Faculty alone has the right and obligation to set academic requirements. However, the students and faculty will work together to establish optimal conditions for honorable academic work.

Violations of the Honor Code

Examples of conduct that will be regarded as being in violation of the Honor Code include:

- Copying from another's examination paper or allowing another to copy from one's own paper.
- Plagiarism in any shape or form. Plagiarism is defined as the use, without giving reasonable and appropriate credit to or acknowledging the author or source, of another person's original work, whether such work is made up of code, formulas, ideas, language, research, strategies, writing or other form(s).
- Giving or receiving unpermitted aid either in person or via electronic devices.
- Engaging in unauthorized collaboration on academic assignments or examinations.
- Representing as one's own work the work of another.

Penalties for Violating the Honor Code

Most student disciplinary cases have involved Honor Code violations. Of these, most cases arise when a student submits another's work as his or her own, gives or receives unpermitted aid, or engages in unauthorized collaboration. If a violation occurs during a quiz or on a homework assignment, the student will receive a zero for that quiz or assignment. If a violation occurs on an examination or a final project that compromises at least 15% of the final grade, the student will receive a failing grade for the course. The standard penalty for a first offense may include suspension from the College of Engineering, Design and Computing for a severe infraction of the Honor Code. The penalty for a second violation will be expulsion from the College of Engineering, Design and Computing. An instructor who notices a violation should report it to the Department Chair. The Department Chair makes a confirming determination if a violation has occurred and writes a formal letter to the student describing the penalty that will be imposed.

It is the responsibility of the student to seek clarification from the instructor when in doubt about these guidelines.

By signing below, I affirm that I have read and understood the Student Honor code and will abide by its provisions.

Student Name (*printed*): _____

Student ID: _____

Student Signature: _____

Date: _____