

CE 3342 – Water and Wastewater Engineering – Spring 2020

The University of Texas at El Paso
 Department of Civil Engineering
 Class: M & W 10:30-11:20pm, UGLC 342
 Lecture CRN: 28312
 Laboratory: M, W, or F 1:30-4:20pm, ENGR 204
 Laboratory CRNs: M–28323, W–28324, &
 F–28325

Instructor: W. Shane Walker, Ph.D., P.E.
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 Office hours: Mon & Wed, 2:30-3:30pm

Prerequisites: CE 2375 and Junior Standing

NOTICE: Degree Plan Change

In previous semesters, CE 3342 was only lecture, and the CE 3153 laboratory was a separate course. However, in the new B.S. C.E. degree plan, this course is now an integrated lecture and laboratory. Thus, students taking this course this semester need to be aware of several directives:

- If you are on an old degree plan that requires both CE 3342 (lecture only) and CE 3153 (lab), then:
 - If you have not already taken CE 3342 (lecture only), then you will need to register for both the CE 3342 (now both lecture (28312) and a Mon (28323), Wed (28324), or Fri (28325) lab) and CE 4171 Engineering Problems (20510), so that you can satisfy the four credit-hour requirement for your degree plan. When you apply for graduation, the combination of the new CE 3342 combined with CE 4171 will count together for credit for CE 3342 and CE 3153.
 - If you already passed CE 3342 (lecture only) in a previous semester but not CE 3153 (lab only), then you only need to register for CE 3153 lab only, either Mon (25824), Wed (25825), or Fri (25826).
 - If you already passed CE 3153 (lab only) in a previous semester but not CE 3342, then you need to register for CE 3342 (28312), and you need to complete the same assignments as the students enrolled in CE 4171 to earn the full three hours of credit this semester.
- If you are on the new degree plan which does not require CE 3153 (lab), then you will need to register for only the CE 3342 (lecture and lab).

Philosophy

I believe that *teaching* and *learning* are interdependent; you cannot have one without the other. You and I are partners and colleagues, working together to help you become a knowledgeable, curious, intrinsically motivated, and confident engineer. I want to help you become a critical thinker with sharpened skills of analysis, evaluation, and synthesis. I incorporate team-based, hands-on projects in this course to help you prepare for professional practice and to help you develop as a more robust and intrinsically-motivated engineer. I have also realized that it is important to provide weekly homework assignments and quizzes, which help students keep up with understanding and applying concepts. Thus, I have implemented a combination of homework assignments, book reading, quizzes, online forum discussions, exams, and team projects in this course.

Required Textbook: **Davis (2010) Water and Wastewater Engineering (Professional Edition), McGraw Hill (9780071713849)**

You can access this textbook at UTEP online FREE OF CHARGE:

<https://www.accessengineeringlibrary.com/content/book/9780071713849>

You can also set up off-campus access (<https://www.accessengineeringlibrary.com/off-campus-access>) that will provide access to the site even when not on the UTEP network. If you have any questions about accessing the site, please ask your librarian.

Supplemental Texts:

- AWWA & ASCE (2012) *Water Treatment Plant Design*, 5th Ed, McGraw Hill, <https://accessengineeringlibrary.com/browse/water-treatment-plant-design-fifth-edition>;
- AWWA (2011) *Water Quality & Treatment*, 6th Ed, <https://accessengineeringlibrary.com/browse/water-quality-and-treatment-a-handbook-on-drinking-water-sixth-edition>;
- Metcalf & Eddy (2007) *Water Reuse*, McGraw Hill, <https://accessengineeringlibrary.com/browse/water-reuse-issues-technologies-and-applications>;
- Viessman et al (2009) *Water Supply & Pollution Control*, 8th Ed., Prentice Hall;
- Benjamin and Lawler (2013) *Water Quality Engineering: Physical & Chemical Trt. Proc.*, Wiley;
- MWH (2012) *Water Treatment: Principles and Design*, 3rd Ed., Wiley;
- Metcalf & Eddy (2014) *Wastewater Engineering: Treatment and Reuse*, 5th Ed., , McGraw Hill

Required Laboratory Personal Protective Equipment:

- Lab coat (available at UTEP bookstore)
- Goggles or protective eyeglasses (available at UTEP bookstore)

Description and Objectives

This course involves a study of theory and preliminary design of basic physical, chemical, and biological processes involved in drinking water and sanitary wastewater treatment systems. The objectives of this course are to develop:

- awareness of the environment in which we, as a society, live and the significance of the local, state, national, and global water problems that face the engineering community. (ABET Student Outcome 4)
- design background required to solve problems dealing with water quality, water & wastewater treatment, water storage, and water regulation. (ABET Student Outcome 1)
- preliminary design of conventional coagulation, flocculation, sedimentation, and granular media filtration treatment processes. (ABET Student Outcome 2)
- preliminary design of membrane filtration and desalination processes. (ABET Student Outcome 2)
- preliminary design of conventional activated-sludge wastewater treatment processes. (ABET Student Outcome 2)
- the ability to work in teams on complex design problems with written and oral communication. (ABET Student Outcome 5)
- design knowledge sufficient to pass the water and wastewater problems on the Fundamentals of Engineering (FE) exam and the Professional Engineering (PE) exam. (ABET Student Outcome 2)

Topics Covered

The topics covered in this course are:

1. Water Resources Planning and Management
2. Water Quality Parameters and Regulations
3. Conventional Drinking Water Treatment Processes
4. Advanced Water Treatment Processes
5. Biological Wastewater Treatment Processes
6. Sludge Processing
7. Water Reclamation and Reuse

Expectations

Participation: More than simply attending class, you are invited to *think*, and *participate* in the lectures and discussions. I encourage you to be curious and inquisitive during class discussions and online forums.

Preparedness: I recommend that you bring the textbook, a personal course notebook, a pen or pencil, a calculator, completed homework assignments, and questions from the homework and assigned reading.

Punctuality: You are expected to be on time to class, laboratory exercises, and plant tours. Late assignments will not be accepted.

Ethics: In engineering, personal integrity is of utmost importance, especially in the assessment and reporting of environmental conditions. Also, in most cases, it is necessary to work in teams to develop and design optimal solutions to problems and challenges, and it is essential that each team member contribute to the productivity of the team. In this course, I strongly recommend that you complete homework assignments in teams; in many cases, you will help each other through the solution of difficult problems. My goal for the homework is for you to develop proficiency in the basic application and calculations in design. Thus, every student is accountable for *understanding* the concepts, analysis, and solution. My goal for the projects is for you to have opportunity to apply this theory in a deeper and more meaningful way than homework. Each student is accountable for understanding and *contributing* (equitably) to the team projects. Any student committing plagiarism (*e.g.*, copying another's work without understanding) or any other form of academic dishonesty will be reported to the Dean of Students for disciplinary action (which may include expulsion from the University). For a concise summary of engineering ethics, I have provided here the Fundamental Canons within the [Code of Ethics](#) of the American Society of Civil Engineers (ASCE):

1. *Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development³ in the performance of their professional duties.*
2. *Engineers shall perform services only in areas of their competence.*
3. *Engineers shall issue public statements only in an objective and truthful manner.*
4. *Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.*
5. *Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.*
6. *Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.*
7. *Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.*

Homework

Homework assignments will be completed through Quest Learning and Assessment (<https://quest.cns.utexas.edu>), a web-based content and homework delivery system maintained by The University of Texas at Austin. Please go to <https://wikis.utexas.edu/display/questla/Obtaining+a+University+of+Texas+EID> for instructions on how to sign up for the Quest system. During the beginning of this course, when you log into Quest, you will be asked to pay \$30 via credit card on a secure payment site (<https://getquest.cns.utexas.edu/students/collegiate-subscriptions>), which goes toward the maintenance and operation of the resource. You can enroll in the homework portal for this course by searching for the CRN (28312) or by clicking this link: <https://quest.cns.utexas.edu/student/elements?courseuser=2904591>.

Quizzes

We will be using a cloud-based student response software by iClicker in class this semester for quizzing and polling. You will need to create an iClicker Reef Student account to participate in class using your laptop, smart phone, or tablet connected to the university's Wi-Fi (UTEPSecure) or to your mobile data plan. Download the iClicker Reef (REEF polling) app on your smart phone (available for Android and Apple devices). If you have not used iClicker Reef before, then you can see these instructions: https://www.utep.edu/technologysupport/Files/docs/iClicker-Reef_Student-Signup-Instructions.pdf You will need to sign up (create a new account). **When creating your account, use your university email address** (username@miners.utep.edu). After logging in, click the "plus" button to add a new course, select The University of Texas at El Paso, and then search for CE 3342, and select this course. You will NOT need to purchase a subscription to use iClicker REEF this semester because it is provided to you for FREE. Note: submitting votes for a fellow student is considered cheating and a violation of the University Honor Code and the Civil Engineering Honor Code. If you are caught voting for another student or have votes in a class that you did not attend, you will be referred to OSCCR for disciplinary action.

Packback Forum

Packback Questions is an online curiosity community where you can be fearlessly curious and ask big questions about how what we're studying relates to life and the real world. Packback will be assisting you with developing writing skills while enhancing your ability to critically analyze the discussions of this course to draw real-world conclusions. For a brief introduction to Packback Questions and why we are using it in class, watch this video: <https://vimeo.com/163888277>. I believe that your life-long learning is more affected by seeking to know WHY than WHAT. In this course, I want you to empower yourself through deep connections between the course materials and your why. Your time in my course will be brief, but your potential to make the most of your life is great. I hope that through this forum you are able to be inspired by your peers to make the most of your learning.

Before you start posting, be sure to read the Community Guidelines found in the tutorial on Packback. If your post doesn't follow the Packback Community Guidelines, there is a chance it will be removed and you won't receive points for that post. **There will be a weekly deadline of Friday at 11:59pm Mountain Time for submitting posts.** Note: it takes 24 hours for the Packback team to moderate a post and send a coaching email. If by any reason your post is moderated because it does not meet the Community Guidelines, you will need to edit and re-publish your post to receive credit for the week. It is important that you complete your Packback questions and responses several days in advance of the deadline in case your post is moderated.

How to Register on Packback: You will receive a welcome email from holla@packback.co prompting you to finish registration and payment (\$25). Packback has already created an account for you with your UTEP email address, so all you need to do is reset your password. This email may be directed to spam or filtered out, so make sure you do a thorough scan of your inbox if you can't find the email. If you have ANY questions or concerns regarding Packback throughout the semester, please contact the customer support team at holla@packback.co!

Since this involves weekly professional writing, I encourage you to use this opportunity this semester to improve your technical and professional writing skills. I strongly encourage you to use a grammar check (e.g., <http://www.grammarly.com>) and proofread your questions and responses before posting. Unfortunately, popular culture is to make opinionated statements on social media, but in this platform, we want to postulate questions and make statements based on factual information.

Your participation on Packback will count towards 100% of your overall course grade. Your Packback grade is based on weekly participation: post one Question and two Answers per week, relevant to the assigned chapter that week. By the end of the semester, you should have posted 14 Questions and 28 Responses to other students' Questions (*i.e.*, a total of 42 posts). Part of your Packback grade will be based on your average Curiosity score; an average Curiosity score of 70 will constitute full-credit for the Curiosity score component, and an average Curiosity score of 20 or less will receive no-credit. Your Packback Participation Score (*PPS*) will be calculated according to the following equation:

$$PPS = \left(\frac{N_Q}{14}\right) \left(\frac{N_R}{28}\right) \left(\frac{\max(ACS - 20, 0)}{50}\right)$$

Where N_Q is the number of questions posted, N_R is the number of responses posted, and ACS is the Average Curiosity Score of all of your posts for the semester.

Team Project

Team projects are optional. You may form a team of up to four members, and your team will choose a project. A two-page project proposal must be submitted by the team and approved by me prior to Exam 1.

Course Grade

Assessment of your performance in this course will be determined by homework, quizzes, exams, a team design project, and a peer evaluation. (No makeup exams will be offered.) Handwritten homework calculations must be submitted on engineering paper. The course average will be computed by the one of the following grading schemes:

Evaluation 1 (w/Project)	Fraction (%)
Homework Avg (15)	20
Quiz Avg	10
Laboratory Avg	15
Exam Avg (3)	25
Project	10
Final Exam	20
<i>Total</i>	<i>100</i>

Evaluation 2 (w/o Project)	Fraction (%)
Homework Avg (15)	20
Quiz Avg	10
Laboratory Avg	15
Exam Avg (3)	35
Final Exam	20
<i>Total</i>	<i>100</i>

Graduate students taking this course for graduate credit will be required to complete an individual project and will be graded according to the first evaluation scheme above.

A final exam score of at least 50% is required to pass the course. The final course grade will be determined according to the following:

Course Average (%)	Grade
≥ 90	A
80-89	B
70-79	C
60-69	D
< 60	F

I reserve the right to modify or augment this grading scheme for the sake of improving the educational effectiveness of this course.

Special Accommodations

The University of Texas at El Paso provides, upon request, appropriate academic accommodation for students with disabilities. For more information, contact the Center for Accommodations and Support Services (<https://www.utep.edu/student-affairs/cass/>).

Course Schedule

#	Date	Day	Description	Text	HW
1	Jan 22	Wed	Water Resources Planning and Mgmt.	1.1-8, 2.1-2	1
2	Jan 27	Mon	Water Quality and Treatment Processes	2.3-7	2
3	Jan 29	Wed	CO ₂ /Carbonate System and Alkalinity	6.3	3
4	Feb 03	Mon	Coagulation	6.1-4	3
5	Feb 05	Wed	Flocculation and Mixing	6.5-9	4
6	Feb 10	Mon	Softening	7.1-9	5
7	Feb 12	Wed	Sedimentation	10.1-6	6
8	Feb 17	Mon	Granular Media Filtration	11.1-8	7
9	Feb 19	Wed	Microfiltration and Ultrafiltration	12.1-5	8
10	Feb 24	Mon	EXAM 1	Ch. 1-2, 6-7, 10-11	1-7
11	Feb 26	Wed	Disinfectants and Disinfection Byproducts	13.1-2	9
12	Mar 02	Mon	Disinfection Design	13.1-2	9
13	Mar 04	Wed	Project Team Meeting	-	-
14	Mar 09	Mon	Ion Exchange	8.1-6	10
15	Mar 11	Wed	Arsenic removal	14.2	-
-	Mar 16	Mon	<i>Spring Break – University Closed</i>	-	-
-	Mar 18	Wed	<i>Spring Break – University Closed</i>	-	-
16	Mar 23	Mon	Nanofiltration and Reverse Osmosis	9.1-6	11
17	Mar 25	Wed	Water Plant Residuals Management	15.1-11	-
18	Mar 30	Mon	Distribution corrosion/stability	7.8	-
19	Apr 01	Wed	Project Team Meeting	-	-
20	Apr 06	Mon	Wastewater Collect. and Treatment	18.1-7, 20.1-6	12
21	Apr 08	Wed	EXAM 2	Chapters 8-9, 12-15	8-11
22	Apr 13	Mon	Primary Treatment and Flow equalization	21.1-6 and 20.7	12
23	Apr 15	Wed	Microbiology	22.1-9	12
24	Apr 20	Mon	Secondary Trtmnt: suspended	23.1-9	13
25	Apr 22	Wed	Secondary Trtmnt: attached	24.1-6	13
26	Apr 27	Mon	Second. Settling, Disinfect., and Re-aer.	25.1-5	13
27	Apr 29	Wed	Sludge Thickening, Digest., and Dewater.	27.1-13	-
28	May 04	Mon	Tertiary Treat. and Potable Reuse	26.1-5	-
29	May 06	Wed	EXAM 3	Chapters 12-20	12-13
30	May 15	Fri	FINAL EXAM, 10:00 am – 12:45 pm	(comprehensive)	1-13

Lab Schedule

Lab	Week starting	Description
-	Jan 20	<i>No labs this week (MLK Jr. Holiday on Monday)</i>
1	Jan 27	Safety Briefing, Documentary: Last Call at the Oasis (2011)
2	Feb 03	pH and alkalinity
3	Feb 10	Turbidity, conductivity, TSS, & TDS
4	Feb 17	Tour: Canal Street Drinking Water Treatment Plant
5	Feb 24	Titration: hardness, chloride, & sulfate
6	Mar 02	Spectrophotometers (chlorine); IDEXX Most Probable Number (Coliforms & <i>E. coli</i>)
7	Mar 09	Tour: Parkhill, Smith, & Cooper Engineering Office
-	Mar 16	<i>No classes this week (Spring Break)</i>
-	Mar 23	<i>No labs this week (Cesar Chavez Holiday on Friday)</i>
8	Mar 30	Tour: Kay Bailey Hutchison Plant Desalination Plant
-	Apr 06	<i>No labs this week (Spring Study Day on Friday)</i>
9	Apr 13	DO, BOD, COD
10	Apr 20	Tour: Hickerson Wastewater Treatment Plant
11	Apr 27	Tour: Fred Hervey Wastewater Reuse Plant
-	May 04	<i>No labs this week (Dead Day on Friday)</i>