

## CE 3342 – Water and Wastewater Engineering – Spring 2019

The University of Texas at El Paso  
 Department of Civil Engineering  
 Class: Tues/Thurs 12:00-1:20pm, UGLC 220  
 CRN: 28496  
 Prerequisites: CE 2375 and Junior Standing

Instructor: W. Shane Walker, Ph.D., P.E.  
 Email: [wswalker2@utep.edu](mailto:wswalker2@utep.edu)  
 Office: Engineering A-215  
 Phone: (915) 747-8729  
 Office hours: Tues/Thurs, 1:30-2:30pm

### 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://accessengineeringlibrary.com/browse/water-and-wastewater-engineering-design-principles-and-practice>

You can also download a roaming passport (<https://accessengineeringlibrary.com/roaming>) that will provide access to the site even when not on the network. If you have any questions about accessing the site, please ask your librarian.

**Required Reading:** **Scott Harrison (2018) Thirst: A Story of Redemption, Compassion, and a Mission to Bring Clean Water to the World, Currency (9781524762841)**

Supplemental Texts:

- AWWA & ASCE (2012) Water Treatment Plant Design, 5<sup>th</sup> Ed, McGraw Hill, <https://accessengineeringlibrary.com/browse/water-treatment-plant-design-fifth-edition>;
- AWWA (2011) Water Quality & Treatment, 6<sup>th</sup> 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, 8<sup>th</sup> Ed., Prentice Hall;
- Benjamin and Lawler (2013) Water Quality Engineering: Physical & Chemical Trt. Proc., Wiley;
- MWH (2012) Water Treatment: Principles and Design, 3<sup>rd</sup> Ed., Wiley;
- Metcalf & Eddy (2014) Wastewater Engineering: Treatment and Reuse, 5<sup>th</sup> Ed., , McGraw Hill

### 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 problems that face the engineering community. (ABET Outcomes H, I, J)
- design background required to solve problems dealing with water quality, water & wastewater treatment, water storage, and water regulation. (A, C, E)
- preliminary design of conventional coagulation, flocculation, sedimentation, and granular media filtration treatment processes. (C, F, L)
- preliminary design of membrane filtration and desalination processes. (C, F, L)
- preliminary design of conventional activated-sludge wastewater treatment processes. (C, F, L)
- the ability to work in teams on complex design problems and become effective written and oral communicators. (C, D, G)
- design knowledge sufficient to pass the water and wastewater problems on the Fundamentals of Engineering (FE) exam and the Professional Engineering (PE) exam. (C, F, K, L)

### 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 development<sup>3</sup> 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

Some of the homework assignments will be completed through the UTEP Blackboard website (available through <https://my.utep.edu/>), and some 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 through this link: [https://quest.cns.utexas.edu/student/courses/enroll\\_by\\_link?courseunique=225249](https://quest.cns.utexas.edu/student/courses/enroll_by_link?courseunique=225249)

### 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. Sign in to Blackboard (available from <https://my.utep.edu/>) and click the link for this course. Click the iClicker REEF icon on the Home Page to launch a special instance of REEF, then log in, or create a new REEF account if you don't already have one. **When creating your account, use your university email address** (username@miners.utep.edu). You will NOT need to purchase a subscription to use iClicker REEF this semester because it is provided to you for FREE. Signing into REEF through the link in Blackboard will automatically add you to my course. When asked to register a remote device, choose "not at this time". 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.

Your participation on Packback will count towards 10% of your overall course grade. Half of your Packback grade (*i.e.*, 5% of your overall course grade) will be constituted by weekly participation: post one Question and two Answers per week relevant to water resources management, water quality, and water treatment. The other half of your Packback grade (*i.e.*, 5% of your overall course grade) will be based on your average Curiosity score; an average Curiosity score of 70 will constitute full-credit, and an average Curiosity score of 20 or less will receive no-credit.

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 Monday 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!

**Team Project**

You will be assigned to a team, and your team will choose a project. You may choose to design a surface water treatment plant as a conventional coagulation, flocculation, sedimentation (CFS) process with membrane filtration, or you may choose an alternative project. Peer evaluations of team members will be based on five dimensions of team-member contributions (Contributing to Work; Interacting with Teammates; Keeping Team on Track; Expecting Quality; and Having Knowledge/Skills).

**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:

<b>Evaluation A (w/Project)</b>	<b>Fraction (%)</b>
Homeworks (17)	20
Quizzes	10
Packback	10
Midterm Exams (3)	30
Team Project (Report)	10
Final Exam	20
<i>Total</i>	<i>100</i>

  

<b>Evaluation B (w/o Project)</b>	<b>Fraction (%)</b>
Homeworks (17)	20
Quizzes	10
Packback	10
Midterm Exams (3)	40
Final Exam	20
<i>Total</i>	<i>100</i>

Graduate students taking this course for graduate credit will be graded by the following:

<b>Evaluation</b>	<b>Fraction (%)</b>
Homeworks (17)	20
Quizzes	10
Packback	10
Midterm Exams (3)	30
Individual Project (Report)	10
Final Exam	20
<i>Total</i>	<i>100</i>

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

Class	Day	Date	Topics	Reading	Assignment
1	T	JAN	22	Documentary: <i>Last Call at the Oasis</i> (2011)	HW 1
2	R		24	Water Resources Planning and Mgmt.	1.1-8, 2.1-2 HW 2
3	T		29	Water Quality and Treatment Processes	2.3-7 HW 2
4	R		31	Coagulation	3.1-4 HW 3
5	T	FEB	5	Flocculation and Mixing	3.5-9 HW 4
6	R		7	Softening and Redox	4.1-9 HW 5
7	T		12	Sedimentation	7.1-6 HW 6
8	R		14	Granular Media Filtration	8.1-8 HW 7
9	T		19	Disinfection and Fluoridation	10.1-6 HW 8
10	R		21	Microfiltration and Ultrafiltration	9.1-5 HW 9
11	T		26	<b>EXAM 1</b>	<b>Chapters 1-4, 7-8</b> <b>HW 1-7</b>
12	R		28	<i>Drinking Water Treatment Plant Tour</i>	<i>Canal Plant</i> -
13	T	MAR	5	Nanofiltration and Reverse Osmosis	6.1-6 HW 10
14	R		7	Project Team Meeting	- -
-	T		12	Ion Exchange	5.1-6 HW 114
-	R		14	Water Plant Residuals Management	11.1-11 HW 11
15	T		19	<i>Spring Break</i>	- -
16	R		21	<i>Spring Break</i>	- -
17	T		26	<i>Desalination Plant Tour</i>	<i>Kay Bailey Hutchison Plant</i> -
18	R		28	Wastewater Collect. and Treatment	12.1-7, 13.1-6 HW 12
19	T	APR	2	Primary Treatment and Flow equalization	14.1-6 and 13.7 HW 12
20	R		4	<b>EXAM 2</b>	<b>Chapters 5-6, 9-11</b> <b>HW 8-11</b>
21	T		9	Microbiology	15.1-9 HW 12
22	R		11	Secondary Trtmnt: attached	17.1-6 HW 13
23	T		16	Secondary Trtmnt: suspended	16.1-9 HW 13
24	R		18	Second. Settling, Disinfect., and Re-aer.	18.1-5 HW 13
25	T		23	Sludge Thickening, Digest., and Dewater.	20.1-13 HW 14
26	R		25	<i>Wastewater Treatment Plant Tour</i>	<i>Hickerson Plant</i> -
27	T		30	Tertiary Treat. and Potable Reuse	19.1-5 HW 15
28	R	MAY	2	Project Team Meeting	- -
29	T		7	<i>Tour of Engineering Consultant Office</i>	<i>Parkhill, Smith, &amp; Cooper</i> Project Rept. Due
30	R		9	<b>EXAM 3</b>	<b>Chapters 12-20</b> <b>HW 12-15</b>
31	T		14	<b>Final Exam, 1:00pm-3:45pm</b>	<b>(comprehensive)</b> <b>Exams 1, 2, &amp; 3</b>