

## CE 5344 – Biological Unit Operations/Processes – Spring 2021

The University of Texas at El Paso  
Civil Engineering  
Lecture: ONLINE-asynchronous  
CRN: 28949  
Cross-listed:  
CE 4375 (23788)  
CE 4376 (23793)  
CE 4377 (25578)  
Prerequisites: CE 4342

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**NOTICE: To mitigate spread of COVID-19 (coronavirus SARS-CoV-2), this course will be only ONLINE. Homework assignments and exams will all be conducted asynchronously online, and communication will be sent by email through Blackboard (<https://my.utep.edu/>).**

**Students are required to have a webcam to take online exams.**

### **NOTICE: COVID-19**

**Students are not permitted on campus when they have a positive COVID-19 test, exposure, or symptoms.**

You must STAY AT HOME and REPORT if you (1) have been diagnosed with COVID-19, (2) are experiencing COVID-19 symptoms, or (3) have had recent contact with a person who has received a positive coronavirus test. Reports should be made at [screening.utep.edu](https://screening.utep.edu). If you know anyone who should report any of these three criteria, encourage them to report. If the individual cannot report, you can report on their behalf by sending an email to [COVIDaction@utep.edu](mailto:COVIDaction@utep.edu).

For each day that you attend campus—for any reason—you must complete the questions on the UTEP screening website ([screening.utep.edu](https://screening.utep.edu)) prior to arriving on campus. The website will verify if you are permitted to come to campus. Under no circumstances should anyone come to class when feeling ill or exhibiting any of the known COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, and alternative instruction will be provided. Students are advised to minimize the number of encounters with others to avoid infection.

Wear face coverings when in common areas of campus or when others are pre-sent. You must wear a face covering over your nose and mouth at all times in this class. If you choose not to wear a face covering, you may not enter the classroom. If you remove your face covering, you will be asked to put it on or leave the classroom. Students who refuse to wear a face covering and follow preventive COVID-19 guidelines will be dismissed from the class and will be subject to disciplinary action according to Section 1.2.3 *Health and Safety* and Section 1.2.2.5 *Disruptions* in the UTEP Handbook of Operating Procedures.

## 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 grow as a knowledgeable, curious, intrinsically motivated, and confident engineer. I want to help you grow as a critical thinker with sharpened skills of analysis, evaluation, and synthesis. I incorporate team-based projects 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 to help reinforce understanding and application of the main concepts. Thus, I have implemented a combination of homework assignments, online forum discussions, exams, and team projects in this course.

**Required Text: Metcalf & Eddy (2014) Wastewater Engineering: Treatment and Reuse, 5th Ed., McGraw Hill** (Textbook Website: [www.mhhe.com/metcalf](http://www.mhhe.com/metcalf))

Supplemental Texts: Rittman & McCarty (2001) *Environmental Biotechnology*, McGraw Hill;

Davis (2020) *Water and Wastewater Engineering, 2nd Ed.*, McGraw Hill;

Viessman et al (2009) *Water Supply & Pollution Control, 8th Ed.*, Prentice Hall;

Droste (1997) *Theory and Practice of Water and Wastewater Treatment*, John Wiley & Sons;

## Description and Objectives

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

1. design background required to solve problems dealing with water quality, wastewater treatment, water storage and water regulation.
2. design knowledge sufficient to pass the Environmental Engineering section of Fundamental Engineering (FE/EIT) exam and the Professional Engineering (PE) exam.
3. the ability to work in teams on complex design problems.
4. an 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.

## Topics Covered

The topics covered in this course are:

1. Wastewater Quality Parameters and Regulations
2. Biological Wastewater Treatment Processes
3. Wastewater Reclamation and Reuse
4. Sludge Processing

## 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 lectures and discussions.

**Punctuality:** Assignments submitted late will receive half credit.

**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 for this class. 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/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 (28949).

Homework assignments will typically be open two to seven days before the due date, and students will be notified by email when assignments are posted on Quest.

### Exams

Exams will be administered and proctored (<https://wikis.utexas.edu/display/questla/Proctoring>) asynchronously through Quest over a 24 hour period (12:00 am to 11:59 pm) on the date specified in the [course schedule](#) (near the end of this syllabus). **Students are required to have a webcam to take online exams.** You must complete the exam within 90 minutes of starting the exam. If you have any concern about the stability or reliability of your off-campus internet access, then I recommend that you plan on taking the exams at the UTEP Library.

Exams are open book, open notes, and open homework, and you are allowed to use a calculator. You are NOT allowed to use a cell phone or tablet in any way during the exam. **On the date of an exam, you are NOT allowed to communicate in any way with anyone (except the instructor) about the exam.** You are required to have a functioning webcam for online proctoring. When you begin the exam, you are required to show a 360° view of your surroundings, and you must show a close up of your calculator so that the brand and model number are readable. If your webcam does not work for part of the exam, your exam grade will be reduced by 10 points per minute that your camera is not working.

### Packback Forum

Packback 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.

How to Register on Packback: You will receive a welcome email from [help@packback.co](mailto:help@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. But, if you can't find the email, then you may register by following the instructions: First, create an account by navigating to <https://questions.packback.co> and clicking "Sign up for an Account". Or if you already have an account on Packback, then you can log in with your credentials. Second, then enter our class community's lookup key into the "Looking to join a community you don't see here?" section in Packback at the bottom of the homepage (Community Lookup Key: 1fe24819-08d6-48d0-869e-fac84e31f9b3). Finally, follow the instructions on your screen to finish your registration. If you have ANY questions or concerns regarding Packback throughout the semester, please contact the customer support team at [help@packback.co](mailto:help@packback.co).

For this course, your participation on Packback will count towards 15% of your overall course grade. Your Packback grade is based on weekly participation: post one Question and two Responses 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 90 will constitute full-credit for the Curiosity score component, and an average Curiosity score of 65 or less will receive no-credit. The Packback Participation Score (*PPS*) for CE 3342 will be calculated according to the following equation:

$$PPS = \left(\frac{N_Q}{14}\right) \left(\frac{N_R}{28}\right) \left(\frac{ACS - 65}{25}\right) \left(1 - \frac{N_{IW} - 1}{14}\right)$$

where  $N_Q$  is the number of questions posted,  $N_R$  is the number of responses posted,  $ACS$  is the Average Curiosity Score of all of your posts for the semester, and  $N_{IW}$  is the number of inactive weeks (no posts).

**Since this is a graduate-level course, in order to catalyze independent thinking and literature review skills, each week you will harness your curiosity around the course topic for that week, and find a peer-reviewed journal article related to your question or response. When you post your question or response, be sure to include the complete DOI hyperlink (*e.g.*, <https://doi.org/10.1039/D0EN00194E>). When you post a response on a classmate's question, find a different peer-reviewed journal article that addresses their question, and be sure to include the complete DOI hyperlink ("http...").** In addition to searching on [Google Scholar](#), here are a few specific recommended journals related to this course, and you should be able to access these for free through the [UTEP VPN](#):

- Journal of Environmental Engineering (<https://ascelibrary.org/journal/joeeedu>)
- Environmental Science & Technology (<https://pubs.acs.org/journal/esthag>)
- Water Research (<https://www.journals.elsevier.com/water-research>)
- Journal of Membrane Science (<https://www.journals.elsevier.com/journal-of-membrane-science>)
- Science of the Total Environment (<https://www.journals.elsevier.com/science-of-the-total-environment>)
- Water Environment Research (<https://onlinelibrary.wiley.com/journal/15547531>)

On Packback, each post (question or response) must cite at least one peer-reviewed journal article. If you find a relevant article that does not have a DOI, then it is probably not peer-reviewed. But just because it has a DOI does not guarantee that it is peer-reviewed. I don't have anything against scientific blogs and such, but in a world of social media that is inundated with people passing off their opinion as fact (which is so nauseating!), as engineers, we need to help guide people with objective truth. Of course, the peer-review process does not guarantee truth or accuracy, but it often helps improve accuracy and prevents well-intentioned knuckleheads or agenda-driven self-professed "scientists" from expressing unfounded opinions as "truth". In other words, the peer-review process is at least one barrier to the propagation of nonsense. As a general rule (though not always the case), journals with a higher impact factor tend to be more selective in their publications, so (theoretically), you are less likely to see a junk paper in their journals. I provided the list of some journals (above) that tend to be more trustworthy.

Also, simply listing a citation at the end of your post is insufficient. You need to reference the citation in the post. For example, "According to [insert lead author's last name here] et al. ([insert year of publication here]), [summarize here what you learned from reading the paper]."

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 Sunday at 11:59 PM 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. **With respect to the weekly question post, please focus on one of the two lesson topics listed for that week in the course schedule (provided at the end of this syllabus). Please try to post your question by Thursday evening so that everyone has time to post responses before the Sunday night deadline.**

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 includes making opinionated statements on social media, but in this platform, we want to postulate questions and make statements based on factual information.

**Evaluation**

Assessment of your performance in this course will be determined by class attendance and participation, homework quizzes, and exams. (No makeup exams will be offered.) The total course average will be computed by the following:

<b>Evaluation</b>	<b>Contribution (%)</b>
Homework	20
Packback Participation Score	15
Exams (3)	30
Final Exam	20
Design Project	15
<b>Total</b>	<b>100</b>

The final course grade will be determined according to the following:

<b>Average (%)</b>	<b>Grade</b>
≥ 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.

**Copyright Statement for Course Materials**

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

**General Student Services and Support:**

UTEP provides a variety of student services and support:

Technology Resources

- [Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.
- [Engineering Technology Center \(ETC\)](#): Engineering software and computer support.
- [UTEP My.Apps](#): server-based software access

Academic Resources

- [UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- [University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- [Engineering Tutoring Center \(ACES\)](#): Tutors are recruited from engineering and science student organizations and honor societies.
- [Math Tutoring Center \(MaRCS\)](#): Ask a tutor for help and explore other available math resources.
- [History Tutoring Center \(HTC\)](#): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- [RefWorks](#): A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources

- [Military Student Success Center](#): Assists personnel in any branch of service to reach their educational goals.
- [Counseling and Psychological Services](#): Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.

**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/>).

**Tentative Course Schedule**

<b>Week</b>	<b>Day</b>	<b>Lesson</b>	<b>Description</b>	<b>Text</b>
1	Jan 19	1	Intro to Wastewater Treatment	1.1-8
	Jan 21	2	Wastewater characteristics, flow, and loads	2.1-10; 3.1-7
2	Jan 26	3	Wastewater treatment process design	4.1-5, 18.1
	Jan 28	4	Screening, Coarse Solids, Grit, Primary Sed.	5.1-6
3	Feb 2	5	Microbiology and metabolism	7.1-4
	Feb 4	6	<i>Guest Lecture – WW Engr Consultant</i>	-
4	Feb 9	7	Kinetics; suspended, and attached growth	7.5
	Feb 11	8	Activated sludge process	7.6, 8.1-5
5	Feb 16	9	Biological nitrification and denitrification	7.9-10, 8.6-7
	Feb 18	10	Biological phosphorous removal	7.13, 8.8
6	Feb 23	11	Wastewater treatment plant modeling	-
	Feb 25	12	Aeration	5.10-11, 8.9
7	Mar 2	-	<b>EXAM 1</b>	<b>Ch. 1-5, 7.1-5</b>
	Mar 4	13	Attached growth: trickling filters, RBCs, MBBRs	7.7, 9.1-5
8	Mar 9	14	Secondary Sedimentation	5.4; 8.10-11
	Mar 11	15	Membrane bioreactors (MBRs)	8.12, 11.7
-	Mar 16	-	<i>Spring Break</i>	-
	Mar 18	-	<i>Spring Break</i>	-
9	Mar 23	16	Tertiary treatment: media filt, membranes	11.1-6
	Mar 25	17	Disinfection	12.1-10
10	Mar 30	18	Advanced Oxidation Processes	6.8
	Apr 1	19	Direct Potable Reuse	-
11	Apr 6	20	Sludge handling and thickening	13.1-8
	Apr 8	-	<b>EXAM 2</b>	<b>Ch. 7.6-7.9, 8-9, 11-12</b>
12	Apr 13	21	Anaerobic treatment	10.1-5
	Apr 15	22	Anaerobic digestion	13.9
13	Apr 20	23	Biosolids and resources recovery	14.1-10
	Apr 22	24	Plant recycle flows and nutrient recovery	15.1-6
14	Apr 27	25	Air handling and odor control	16.1-6
	Apr 29	26	Energy considerations	17.1-10
15	May 4	-	<b>EXAM 3</b>	<b>Ch. 10, 13-17</b>
	May 6	27	<i>Guest Lecture – WW Engr Consultant</i>	-
16	May 12-13	-	<b>FINAL EXAM</b>	<b>(comprehensive)</b>