CE 3342 – Water and Wastewater Engineering – Fall 2019

The University of Texas at El Paso
Department of Civil Engineering
Class: M & W 10:30-11:20pm, CCSB 1.0204
Lecture CRN: 18385
Laboratory: M or W 1:30-4:20pm, ENGR 204
Laboratory CRNs: M – 18416, W – 18417
Prerequisites: CE 2375 and Junior Standing

Instructor: W. Shane Walker, Ph.D., P.E.
Email: wswalker2@utep.edu
Office: Engineering A-215
Phone: (915) 747-8729
Office hours: Mon & Wed, 2:30-3:30pm

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 needs 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 (lecture and lab) and the CE 4171 Engineering Problems course (CRN 16042), and you will have additional reading assignments 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 with the 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, then you only need to register for the CE 3153 (lab).
- 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://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.

Optional 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, 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

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

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

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.

Team Project

Team projects are optional. You may form a team of up to five members, and your team will choose a project. A two page project proposal must be submitted by the team 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 A (w/Project)	Fraction (%)
Homework Avg (15)	20
Quiz Avg	10
Laboratory Avg	15
Midterm Exams (3)	25
Team Project (Report)	10
Final Exam	20
Total	*100*

Evaluation B (w/o Project)	Fraction (%)
Homework Avg (15)	20
Quiz Avg	10
Laboratory Avg	15
Midterm Exams (3)	35
Final Exam	20
Total	*100*

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

Evaluation	Fraction (%)
Homework Avg (15)	20
Quiz Avg	10
Laboratory Avg	15
Midterm Exams (3)	25
Individual Project (Report)	10
Final Exam	20
Total	*100*

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	Aug 26	Mon	Water Resources Planning and Mgmt.	1.1-8, 2.1-2	1
2	Aug 28	Wed	Water Quality and Treatment Processes	2.3-7	2
-	*Sep 02*	*Mon*	*Labor Day Holiday - University Closed*	-	-
3	Sep 04	Wed	CO2/Carbonate System and Alkalinity	6.3	3
4	Sep 09	Mon	Coagulation	6.1-4	3
5	Sep 11	Wed	Flocculation and Mixing	6.5-9	4
6	Sep 16	Mon	Softening	7.1-9	5
7	Sep 18	Wed	Sedimentation	10.1-6	6
8	Sep 23	Mon	Granular Media Filtration	11.1-8	7
9	Sep 25	Wed	Microfiltration and Ultrafiltration	12.1-5	8
10	Sep 30	Mon	**EXAM 1**	**Ch. 1-2, 6-7, 10-11**	**1-7**
11	Oct 02	Wed	Disinfectants and Disinfection Byproducts	13.1-2	9
12	Oct 07	Mon	Disinfection Design	13.1-2	9
13	Oct 09	Wed	Project Team Meeting	-	-
14	Oct 14	Mon	Ion Exchange	8.1-6	10
15	Oct 16	Wed	Arsenic removal	14.2	-
16	Oct 21	Mon	Nanofiltration and Reverse Osmosis	9.1-6	11
17	Oct 23	Wed	Water Plant Residuals Management	15.1-11	-
18	Oct 28	Mon	Distribution corrosion/stability	-	-
19	Oct 30	Wed	Project Team Meeting	-	-
20	Nov 04	Mon	Wastewater Collect. and Treatment	18.1-7, 20.1-6	12
21	Nov 06	Wed	**EXAM 2**	**Chapters 8-9, 12-15**	**8-11**
22	Nov 11	Mon	Primary Treatment and Flow equalization	21.1-6 and 20.7	12
23	Nov 13	Wed	Microbiology	22.1-9	12
24	Nov 18	Mon	Secondary Trtmnt: suspended	23.1-9	13
25	Nov 20	Wed	Secondary Trtmnt: attached	24.1-6	13
26	Nov 25	Mon	Second. Settling, Disinfect., and Re-aer.	25.1-5	13
27	Nov 27	Wed	Sludge Thickening, Digest., and Dewater.	27.1-13	14
-	*Nov 28*	*Thurs*	*Thanksgiving Holiday - University Closed*	-	-
28	Dec 02	Mon	Tertiary Treat. and Potable Reuse	26.1-5	15
29	Dec 04	Wed	**EXAM 3**	**Chapters 12-20**	**12-15**
30	Dec 13	Fri	**FINAL EXAM, 10:00am-12:45pm**	**(comprehensive)**	**1-15**

Lab Schedule

Lab	Week starting		Description
1	Aug 26	Mon	Safety Briefing, Documentary: Last Call at the Oasis (2011)
-	*Sep 02*	*Mon*	*Labor Day Holiday - University Closed (no labs this week)*
2	Sep 09	Mon	pH and alkalinity
3	Sep 16	Mon	Turbidity, conductivity, TSS, & TDS
4	Sep 23	Mon	Tour: Canal Street Drinking Water Treatment Plant
5	Sep 30	Mon	Titrations: hardness, chloride, & sulfate
6	Oct 07	Mon	Spectrophotometers (chlorine, silica)
7	Oct 14	Mon	IDEXX Most Probable Number: Coliforms & *E. coli*
8	Oct 21	Mon	Tour: Kay Bailey Hutchison Plant Desalination Plant
9	Oct 28	Mon	Ion chromatography & ICP
10	Nov 04	Mon	Tour: Hickerson Wastewater Treatment Plant
11	Nov 11	Mon	DO, BOD, COD
12	Nov 18	Mon	Nutrients: nitrogen, phosphorous
13	Nov 25	Mon	Tour: Parkhill, Smith, & Cooper Engineering Office
14	Dec 02	Mon	Tour: Fred Hervey Wastewater Reuse Plant