

1: Course Number and Name

- a. **ENGR 4351:** Water and Wastewater Treatment Design
- b. Section 010, TR 8:00 – 9:15 am

2: Credits and Contact Hours

- a. **Credits:** 3
- b. **Contact Hours:** 3 hours/week (Classroom)

3: Instructor Information

- a. **Course Coordinator:** Soyoon Kum
- b. **Instructor:** Soyoon Kum, 325-486-5508, soyoon.kum@angelo.edu. Office: VIN 282.
For office hours see [faculty homepage](#).

4: Required Course Materials

- a. Required text materials:
 - Mackenzie L. Davis, Ph.D., P.E., BCEE. Water and Wastewater Engineering: Design Principles and Practice, Second Edition (McGraw-Hill Education: New York, Chicago, San Francisco, Athens, London, Madrid, Mexico City, Milan, New Delhi, Singapore, Sydney, Toronto, 2020, 2010). <https://www-accessengineeringlibrary-com.easydb.angelo.edu/content/book/9781260132274>
 - Cornwell, D. A.; Davis, M. L. Introduction to Environmental Engineering, 5th ed.; McGraw-Hill Education, 2012. (ISBN: 978-0073401140)
- b. **Software** None.
- c. **Other Supplemental Materials:**
 - The American Water Works Association (AWWA); The American Society of Civil Engineers (ASCE). Water Treatment Plant Design, Fifth Edition (McGraw-Hill: New York, Chicago, San Francisco, Lisbon, London, Madrid, Mexico City, Milan, New Delhi, San Juan, Seoul, Singapore, Sydney, Toronto, 2012). <https://www-accessengineeringlibrary-com.easydb.angelo.edu/content/book/9780071745727>
 - American Water Works Association; James Edzwald. Water Quality & Treatment: A Handbook on Drinking Water, Sixth Edition (American Water Works Association, 2011, 1999). <https://www-accessengineeringlibrary-com.easydb.angelo.edu/content/book/9780071630115>
 - Metcalf & Eddy, Inc. an AECOM Company; Takashi Asano; Franklin Burton; Harold Leverenz. Water Reuse: Issues, Technologies, and Applications (McGraw-Hill, 2007). <https://www-accessengineeringlibrary-com.easydb.angelo.edu/content/book/9780071459273>

5: Specific Course Information

- a. **Catalog Description:** Learn principles of physical, chemical, and biological processes for the water and wastewater treatment. Design treatment

technologies including coagulation and flocculation, sedimentation, filtration, adsorption, chemical oxidation/disinfection, membrane filtration, biological treatment processes, and sludge management.

- b. **Prerequisites:** CENG 3351; Civil Engineering Majors only, or Departmental permission.
- c. **Required or elective:** Electives (satisfies Design Electives CE Discipline)

6: Specific Goals for the Course

Students who successfully complete this course will be able to:

- 1) Develop awareness of the environment and the significance of the local, state, national, and global water problems that face the engineering community
- 2) Understand and describe details of a typical treatment train in a drinking water or wastewater treatment plant.
- 3) Apply basic understandings of physical, chemical, and biological phenomena to the successful design and operation of water and wastewater treatment plants.
- 4) Design common water unit processes in water and wastewater treatment.
- 5) Design water quality and quantity management processes for alternative water resources.
- 6) Suggest possible solutions for problems which are commonly encountered in the real world of engineering practice in the field of water and wastewater engineering.
- 7) Develop the ability to work in teams on complex design problems with written and oral communication.

Course Learning Outcome Mapping to ABET Criterion 3 Student Outcomes is shown in Table 1.

Table 1: Course Learning Outcomes mapped to ABET Student Outcomes

ABET Student Outcomes	1	2	3	4	5	6	7
1. Solve Problems						X	
2. Design			X	X	X		
3. Communication							X
4. Ethics & Professionalism	X						
5. Teamwork							X
6. Experimentation							
7. Acquire New Knowledge		X					

7: Topics Covered

- 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) Alternative Water Resources and its Treatment Processes

8: Course structure and communication

This course is a face-to-face course and has two 75 minutes lectures per week. To take maximum advantage of this time, you are expected to have done the reading assigned for each class period beforehand. Please bring the textbook, any relevant handouts, and a calculator with you to the class. All additional course resources and reading materials will be available on the Blackboard. This syllabus is subject to change. An instructor's posting to the Blackboard will be considered written notification of any changes to the syllabus or class requirements.

8.1: Calculator policy

The use of a calculator is required and allowed on all exams. Computers, tablets, smart phones, I-pads, and similar electronics are not allowed on tests. Calculators with graphing capabilities will be allowed in the course. Recommended calculators with these capabilities include the HP48, HP49, HP50, TI86, and TI89. However, only calculators currently allowed in the Fundamentals of Engineering (FE) and Professional Engineering (PE) exams will be allowed in exams and quizzes. Please refer to the National Council of Examiners for Engineering and Surveying (NCEES) calculator policy for the list of acceptable calculators (<http://ncees.org/exams/calculator-policy/>).

8.2: Communications

You may communicate with me via Blackboard discussion board, email, phone, or via text. I will respond to email or text messages within 24 hours during working hours Monday through Friday. Weekend messages may not be returned until Monday. Written communication via email: All private communication will be done exclusively through your ASU email address. Check frequently for announcements and policy changes. In your emails to faculty, include the course name and section number in your subject line. The information of Face-to-face office hour is in [faculty homepage](#). Office hour and advising may be arranged with the assistance of Collaborate, Zoom, or another web meeting platform if necessary.

9: Professionalism

Professional engineering standards apply in this class. You are expected to demonstrate a behavior consistent with the conduct of an individual practicing in the engineering profession. You are expected to: (1) come prepared for class; (2) respect faculty and peers; (3) demonstrate responsibility and accountability for your own actions; (4) demonstrate sensitivity and appreciation for diverse cultures, backgrounds, and life experiences; (5) offer and accept constructive criticism in a productive manner; (6) demonstrate an attitude that fosters professional behavior among peers and faculty; (7) be punctual to class meetings; (8) maintain a good work ethic and integrity; and (9) recognize the classroom as a professional workplace.

10: Graded Material

10.1: Homework

There will be several homework assignments during the semester. Problem sets are posted on Blackboard assignment folder and generally due 1 week after being assigned. Most homework assignments are individual work. Handwritten assignments must be completed on engineering paper or provided assignment sheet before being scanned and submitted via Blackboard. You must include homework title, question number, student name(s), course name, instructor name, and due date. Homework answer without the question number is considered as no answer.

Using homework or homework solutions from previous semesters is not allowed.

Homework will be graded using the following scale in Table 2 (100% means full points).

Table 2: Homework grading rules

Percentage	Description
100%	Correct solution, both methodologically and numerically; carefully presented, easy to follow
80%	Correct methodologically, but with minor computational or table look-up errors, leading to erroneous final answer.
60%	Some conceptual error(s) but correct general approach
40%	Major conceptual errors.
20%	Completely missed the point of the problem but made some attempt at a solution.
0*	Did not attempt problem.

10.2: Participation

Your attendance is very important for the effective learning. If you miss more than half of the lectures, you will receive 0 point for the participation. I encourage you to be curious and inquisitive during class discussions. If you actively participate in class discussions, you will receive full points for the participation.

10.3: Project

The design project will be a team effort with 2-3 students per team. Each group will address the existing water and/or wastewater treatment system in a specific area, identify water quality and/or quantity problems in that specific area, and suggest possible design of treatment processes to solve the addressed problems. The task includes the following: 1) review of reports on the nature of the contamination and existing water and/or wastewater treatment system, 2) definition of the present and projected treatment tasks, 3) Evaluation of alternative treatment processes by preparation of preliminary process designs and comparison of the cost and effectiveness of the alternatives, and 4) Preparation of written report and PowerPoint presentation comparatively summarizing the alternatives and recommending a single treatment plan.

10.4: Examinations

There will be two - 75-minute exams. Each examination will be closed book with one page cheat sheet and will be given in class on the date indicated. The exams will cover lecture materials and assigned reading materials. Missed examinations may be made up only if the reason for missing was illness or some other emergency. The final exam will take place during finals. While this exam will focus on the material presented in the half of the class, it is in some sense cumulative because we will be applying the fundamental principles developed in the first half of the course to more advanced topics presented at the end of the semester.

10.5: Grades: Weighting and Letter Grades

The weighting system shown in Table 3 will be used in determining final grade for the course

Table 3: Grade Weighting

Item	Percent
Homework	20%
Exams (2)	Midterm 25% / Final 25%
Design Project	25%
Participation	5%
	100%

The instructor will determine letter grades for the course using his professional judgment, and the following standards as described in the University Catalog:

A = excellent work B = good work C = average work D = poor work F = failing work

11: Classroom and University Policies and Student Support

11.1: General Policies

All students are required to follow the policies and procedures presented in the [Angelo State University Student Handbook](#)¹ and [Angelo State University Catalog](#)².

11.2: Student Disability Services

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at ADA@angelo.edu. For more information about the application process and requirements, visit the [Student Disability Services website](#)³. The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dallas Swafford
Director of Student Disability Services
Office of Student Affairs
325-942-2047
dallas.swafford@angelo.edu
Houston Harte University Center, Room 112

11.3: Title IX at Angelo State University

The University prohibits discrimination based on sex, which includes pregnancy, sexual orientation, gender identity, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination including: sexual assault, sex-based discrimination, sexual exploitation, sexual harassment, public indecency, interpersonal violence (domestic violence and/or dating violence), and stalking. As a faculty member, I am a Responsible Employee meaning that I am obligated by law and ASU policy to report any allegations I am notified of to the Office of Title IX Compliance.

Students are encouraged to report any incidents of sexual misconduct directly to ASU's Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator at:

Michelle Boone, J.D.

Director of Title IX Compliance/Title IX Coordinator

Mayer Administration Building, Room 210

325-486-6357, michelle.boone@angelo.edu

You may also file a report online 24/7 at www.angelo.edu/incident-form⁴

If you are wishing to speak to someone about an incident in confidence you may contact the *University Health Clinic and Counseling Center at 325-942-2173* or the *ASU Crisis Helpline at 325-486-6345*.

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit: www.angelo.edu/title-ix⁵.

11.4: Observance of Religious Holy Day

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for [Observance of Religious Holy Day](#)⁶ for more information.

11.5: Incomplete Grade Policy

It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 [Grading Procedures](#)⁷ for more information.

11.6: Student Conduct Policies

11.6.1: Academic Integrity

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

11.6.2: Plagiarism

Plagiarism is a serious topic covered in ASU's [Academic Integrity policy](#)⁸ in the Student Handbook. Plagiarism is the action or practice of taking someone else's work, idea, etc., and passing it off as one's own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality via Turnitin or SafeAssign. Resources to help you understand this policy better are available at the [ASU Writing Center](#)⁹.

11.6.3: Copyright Policy

Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

12: Course Outline

The course outline is presented in Table 4. Detailed reading and homework assignments along with updates to this schedule will be provided via Blackboard. The following schedule may be modified as the semester progresses.

Table 4: Course Lesson Outline

Week	Lecture Topic	Homework	Project
1	Introduction to Water and Wastewater Treatment Water Quality Parameters and Standards		
2	Water Resources Planning and Management 1 Water Resources Planning and Management 2		Outline Presentation
3	Coagulation and Flocculation Coagulation and Flocculation, and Mixing	Homework #1	
4	Softening: Lime-Soda Softening: Lime-Soda and Ion Exchange	Homework #2	
5	Sedimentation Granular Media Filtration	Homework #3	
6	Membrane Filtration Membrane Filtration	Homework #4	

Week	Lecture Topic	Homework	Project
7	Disinfectants and Disinfection Byproducts Product Stability and Corrosion Control		Mid-term Presentation
8	Review Session Midterm Exam		
	Spring Break		
9	Wastewater Primary Treatment Biological Processes: Wastewater Microbiology		
10	Secondary Treatment by Biological Processes 1 Secondary Treatment by Biological Processes 2	Homework #5	
11	Secondary Treatment by Biological Processes 3 Secondary Settling and Disinfection	Homework #6	
12	Sludge Thickening, Digestion, and Dewatering Sludge Thickening, Digestion, and Dewatering	Homework #7	
13	Tertiary Treatment (Nutrient Removal) Tertiary Treatment (Advanced Treatment)		
14	Reclaimed Wastewater and Potable Reuse Rainwater harvesting and Greywater	Homework #8	
15	Group Project Presentation Review Session		Presentation and Report
16	Final Week	Final exam	

End note:

¹ <http://www.angelo.edu/student-handbook/>

² <http://www.angelo.edu/catalogs/>

³ <http://www.angelo.edu/services/disability-services/>

⁴ <http://www.angelo.edu/incident-form>

⁵ <http://www.angelo.edu/title-ix>

⁶ <http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of>

⁷ <https://www.angelo.edu/content/files/14197-op-1011-grading-procedures>

⁸ <http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php>

⁹ http://www.angelo.edu/dept/writing_center/academic_honesty.php