Tuskegee University
Department of Chemical Engineering
CENG 450 – ENVIRONMENTAL ENGINEERING FUNDAMENTALS
Course Outline
Fall 2021

Course Info

CENG 450, Environmental Engineering Fundamentals, 3 lecture credit hours
Time: 4:00 – 5:00 P.M., MWF; Room: LHFH 528

Instructor:

Dr. Shamim Ara Begum
Associate Professor
Department of Chemical Engineering
Office: Room 522E Luther Foster Hall
Office Phone: 727-8795
E mail: sbegum@tuskegee.edu
Office Hours: MW: 10:00 -11:00 and 1:00 - 3:30; Th: 9:30 -12:30

Catalog Description

History and legal framework of environmental engineering. Chemistry and microbiology in environmental engineering. Water pollution, organic pollution, eutrophication, acidification and heavy metal pollution. Air pollution, water and wastewater treatment technologies; anaerobic digestion and sludge treatment.

Prerequisites

Senior Standing.

Main Textbook

Introduction to Environmental Engineering, 1st Edition, by Richard O. Mines, Jr. and Laura W. Lackey
Publisher: Pearson Education Inc. (2009).
ISBN: 978-0-13-234747-1

Other References

1. Introduction to Environmental Engineering, 3rd Edition, by P.A. Vesilind, S.M. Morgan, L.G. Heine
   Publisher: Cengage Learning-Engineering/ Thomson: Brooks/Cole, (2010).
   ISBN-10:0-495-29583-3, ISBN-13:978-0-495-29583-9
2. Introduction to Environmental Engineering, 3rd Edition by M.L. Davis and D.A. Cornwell,
   McGraw-Hill, ISBN: 0-07-015918-1 (1998)

Course Objectives

This course is designed to introduce the multidisciplinary field of environmental engineering. Few new chemical engineering principles are introduced; rather, students will be made to apply their knowledge of chemistry and chemical engineering principles to solving environmental engineering problems. The course is taught with multiple problem examples to illustrate the environmental engineering applications of fundamental science and engineering principles. A good understanding of the material in this course is essential for the study and understanding of environmental engineering. At the conclusion of the course, the students should have acquired the knowledge necessary to achieve the following:

1. Ability to **apply** basic engineering dimensions and units to environmental engineering calculations, and the application of material balance principles to solving environmental engineering problems.
2. Ability to **discuss** and **analyze** the concept of ecosystems and environmental impact of human activities.
3. Be able to **analyze** the major unit operations involved in drinking water treatment, and be able to **design** basic unit operations. The student should also be able to assess water quality and **understand** the basic water quality standards.
4. Be able to **understand** the concept of water supply, availability, and the hydrologic cycle, and be able to **apply** engineering principles to solving problems involving water treatment.
5. Be able to **identify**, **recognize** and **comprehend** water treatment problems, and the engineering principles behind the major unit operations employed for water treatment and water distribution.

Course Tasks/Outcomes within each Objective

In order to demonstrate that the above course objectives/outcomes are met, students will be assessed on the following tasks, which contribute to each objective throughout the course duration. Assessment will be based on students' performance in quizzes, exams, and assignments.

Objective 1:

Task (1): Apply engineering dimensions and units in environmental engineering problem solving.

Task (2): Apply material balance and basic reaction kinetics principles in solving environmental engineering problems.

Objective 2:

Task (3): Discuss and analyze material and energy flow in ecosystems, the role of nutrients, consumers, producers, and decomposers, and the interdependency of organisms at different levels within a food chain.

Task (4): Comprehend the impact of pollution and human activities, including nuclear energy systems, on the well-being of ecosystems.

Objective 3:

Task (5): Understand the need for water quality standards and assess water quality in terms of measurable parameters and calculations.

Task (6): Analyze major unit operations in drinking water treatment and be able to design at least one unit operation such as rapid sand filtration system.

Objective 4:

Task (7): Understand the concept of water supply and availability, flow through porous media, and Darcy's equation.

Task (8): Apply engineering principles to solving water treatment problems.

Objective 5:

Task (9) Comprehend the basis for the unit operations used in water treatment such as softening, coagulation & flocculation, thickening/settling, filtration, and disinfection.

Task (10) Recognize and identify the science and engineering principles behind conventional water treatment operations.

ABET (1 – 7) Outcomes Addressed in Course

Outcomes	1	2	3	4	5	6	7
Objective 1	X						
Objective 2	X						
Objective 3	X	X	X				X
Objective 4	X						
Objective 5	X						

Definition of each ABET "1 – 7" Outcomes

1. An ability to identify, formulate and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering solutions and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Grading and Other Policies

- **Effective Spring 2012**, **ALL faculty** and **students** are **REQUIRED** to use **Blackboard.**
- Effective Spring 2018, the **outlook 365 (tuskegee.edu) email system** at Tuskegee University is **REQUIRED** for all instructional administrators, faculty, staff and students.
- It is critical that all homework, quizzes, and exams be completed on time. All homework will be assigned in the class/blackboard and are due at the beginning of **class** on the due date.
- Students are responsible to check the blackboard regularly for any assigned tasks.
- You are expected to be in class on time. If you are unable to attend a class or take an exam, it is your responsibility to present a written valid excuse to your instructor. Valid excuses include serious illness, death in the immediate family, and participation in University-sponsored events. Any other excuse will be evaluated by the instructor. An excused absence allows you to make up any work you missed without any late penalties. Failure to contact the instructor and present her with a valid written excuse will result in an unexcused absence. An unexcused absence means that homework and design report you missed can be turned for 25% deduction in a week of the missed due date.
- In the event of an excused absence, make up assignments (tests, quizzes, homework, design problems) must be done by the next class meeting following the date of the excused absence (unless scheduled with the instructor). Student is responsible for his/her own missed assignments. Student will receive a full credit for class participation for an excused absence.
- Students need to submit their homework/design etc. by themselves. They should not give their homework/design etc. to another student to submit to the instructor. The instructor will not accept this type of submission.
- Quizzes may or may not be announced. Final numerical grades will be determined using the following weighting:

Four class Exams	40%
Quizzes and Homework	15%
Design Report	10%
Attendance	10%
Final Exam	25%
Maximum Possible Score	100%

Final Grades

Final numerical grades will be awarded for cumulative percentage scores as follows:

A	=	90 – 100%
B	=	80 – 89%
C	=	70 – 79%
D	=	60 – 69% (This is a failure grade in the College of Engineering)
F	=	59% and lower (Failure grade everywhere)

Note:
Final letter grades may be curved at the instructor's discretion (e.g., it *may* be possible that a final numerical grade of 88 results in a letter grade of A).

Dress Code

Tuskegee University has implemented a dress code for students, faculty, and staff on campus. The dress general code is "**Business Casual**". Students are required to adhere to this dress code in the classroom. Any student violating the dress code will be asked to leave the classroom, and such student(s) cannot return to class until they are properly dressed. The following are basic requirements of the dress code:

1. Jeans and T-shirts cannot be worn to class unless on Fridays.
2. No head gear, hats, or head covers unless it is required under special circumstances.
3. No sagging or wearing of dark sun shades in class.
4. Any outfit that will inappropriately expose body parts is unacceptable.

COURSE SCHEDULE CENG 450 – FALL 2021

WEEK	TOPIC	Text Chapter/Assignments
1 - 2	Environmental Engineering as a Profession; Review of engineering calculations	Reading Assignments: Chapter 1 Chapter 2
3 - 4	Biological and Ecological Concepts	Chapter 4
EXAM #1		
5 - 8	Design and Modeling of Environmental Systems	Chapter 6
EXAM #2 (Mid-Term)		
9 - 10	Water Quality and Pollution	Chapter 8
11	Introduction to Water Supply Source, and Quality	Chapter 9
EXAM #3		
12	Overview of Surface and Groundwater Treatment Systems	Chapter 9
13 - 16	Water Treatment Processes	Chapter 9
EXAM #4		
Final Exam: Date to be Announced		

Note: Extra handouts will be provided if needed.

Other Policies:

1. Students need to attend the class on time. Otherwise, the student will not be able to get the attendance credit for that class. Sometimes, instructor reserves the right to turn the student away to minimize disruption of the ongoing class.
2. No children or siblings of students will be allowed in class during lectures.

3. Head gear and dark sun shades are not allowed in class, unless they are of religious significance.
4. The course textbook should be brought to all class sessions. However, reading of the course textbook while lecture is ongoing is not allowed, unless directed to do so by the instructor for specific references.
5. Cheating will not be tolerated. Any student caught cheating will get a zero for that quiz and exam.
6. Students are responsible to check the blackboard regularly for any assigned homework and announcements.
7. Students are not allowed to talk with each other during lecture, quizzes, exams, and final exam. If there is an emergency, students need to go outside of the class to talk for maintaining a better learning environment in the classroom.
8. Additional policies will be issued, if they are necessary.

STATEMENTS OF COE EXPECTATIONS REGARDING STUDENTS' ACADEMIC PROFICIENCY

Academic excellence is a tradition of the Tuskegee University College of Engineering, (COE). Students and faculty must collectively and proactively guard this tradition. The college hereby renews its commitment to the tradition by stating as follows:

1. Students are expected to develop self-confidence through acquisition of in-depth knowledge in all subjects through, as a minimum:
    a. Studying to understand rather than studying to get by.
    b. Challenging oneself to solve problems independent of textbooks or formulae sheets
    c. Attempting diverse and multiple problems, multiple times, for depth and breadth of knowledge

2. Students are expected to be self-motivated through setting their own goals & schedules, spending time to study, and sharing their knowledge with peers.
    a. Students should invest a minimum of two hours of study-time per week for every credit hour taken.
    b. Students should seek or establish environments that encourage positive social interaction and engages in active learning.

3. COE is committed to providing support systems to students for higher achievement through the following avenues:
    a. Direct access to instructors
    b. Archives of faculty recorded course lectures
    c. Dedicated peer tutors by fellow students at all academic levels
    d. Periodic visits by alumni and industry subject matter experts
    e. Opportunities for local and national academic related competitions

4. All COE students are expected to take advantage of all support systems. Students are particularly expected to adopt the notions of "self-confidence through knowledge

acquisition" and "self-motivation to bring out best in self" as the COE fundamental culture for success.