CEE 1610: Engineering and Sustainable Development, 3 credits

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Meeting Time: Tuesday and Thursday
2:00 to 3:15
Room 309 BEH

Office hours: Tuesday, 11:00 to 1:00, BEH 153

Required Text: Engineering Applications in Sustainable Design and Development
Streibig, Ogundipe, Papadakis
2016
ISBN-13: 978-1-133-62977-1
e-learning: *Mindtap/Mindlink*

Course Goal:

The goal of this course is provide students a thorough introduction to the broad fields of both sustainable engineering and industrial ecology. The concepts and tools necessary to understand this field of sustainable engineering will be introduced and then applied by students to elucidate problems with the current built environment and systems.

Learning Objectives:

-Define sustainability in relationship to development indexes, consumption, and population trends (chapter 1, abet a, f, h, j)
-Develop frameworks for conceptualizing complex, open system problems, and the inter-relationship of environmental, energy, economic, health, technological, and cultural factors (chapter 7, abet c, f, h, i, j)
-Describe the relationship between global, regional and local environmental impacts, and economic factors (chapter 7, abet f, h)
-Describe the relationship between community sustainability, global climate change, environmental impacts, economic projects, and fossil fuel emissions (chapter 6, abet f, h, I, j)

-Predict and feel concern for the biological and environmental effects of the design of man-made devices (chapter 8, abet f, h)
-Develop frameworks for conceptualizing complex, open system problems, and the inter-relationship of environmental, energy, economic, health, technological, and cultural factors (chapter 8, abet c, e, h)
- Prepare mass balance equations to track materials flows in manufactured products and emissions (chapter 9, abet a, e, h)
- Solve mass balance problems related to impacts of industrial processes (chapter 9, abet, a, e, h)
- Implement sustainability tools, such as life cycle assessment when conducting systems analysis (chapter 9, abet a, c, h)
- Model total material cycles (i.e. product cradle-to-grave life including design, manufacturing, and disposal phases) when developing products and processes (chapter 10, abet a, h)
- Describe green building criteria and evaluate long term sustainability issues associated with built infrastructure (chapter 11, abet c, h, j, k)

Course Description

This sustainable engineering, modular based course is focusing on the following: introduction and motivation, models, climate, energy, air pollution, food, materials, and healthy/sustainable communities. This course combines both traditional, lecture-based learning and delivery with active and experiential learning. Students will be assessed primarily through homework, quizzes, and exams.

The hope of this course is to start you on your way to being part of a new breed of engineers, trained not only in the traditions of your practice, but able to see how your work fits into a much wider system, one which stretches across the entire world and into the both the past and future.

Teaching Assistants:

In my research group, we approach TAs a bit differently. Graders are assigned per module. If you have a question regarding a particular issue, please contact the TA. See "schedule" file for TA assignments.

Course Materials

Lecture notes for the entire semester will be available as downloadable PowerPoint presentations. You may elect to print the slides; to conserve paper, please print the 'Handouts' option with duplex printing

Class Schedule The preliminary class schedule is provided on CW/BB, but it is possible that changes will occur as the semester goes on based on the pace of class. The topics, assignments, and suggested readings are given below. *Additional readings will be added.* Updated schedule will be posted on Blackboard. **You are responsible for checking updates.**

Grading Scale

A: 93 to 100
A-: 90 to 92
B+: 87 to 89
B: 83 to 86
B-: 80 to 82
C+: 77 to 79
C: 73 to 76
C-: 70 to 72
D+: 67 to 69
D: 63 to 66
F: 0 to 62

Grading

CEE 1610	Weighting
Homework	25
Active Learning Activities In-Class	15
Quizzes	15
Class Attendance	5
Reading and Reacting via Social Media Posts	5
Exam 1	20
Exam 2	15
Total	100

Homework

Homework will be issued regularly throughout the semester. Homework is due at the beginning of class on the day it is due; late homework will receive an automatic 20% deduction for every day overdue.

Active Learning Activities

Active learning is a proven, effective education strategy. Therefore, we will be doing active learning activities in class, which may require short written reports or oral presentations on an individual or group basis.

Quizzes

You will have quizzes throughout this course. The quizzes are intended to compliment the homework sets and prepare you for the exams.

Class Attendance

Class attendance, participation and preparation are required. You will receive a grade for your class participation and preparation (just showing up does not guarantee full credit for a class period).

Reading and Reacting via Social Media Posts

(Excerpted From L. Klotz) You will be given reading assignments. Throughout the semester, you will be asked to tweet your main "epiphany" from readings, etc. (it's time to sign up for a twitter account if you don't already have one). This means it will have to be short - but thoughtful! The epiphany should be your #1 insight that was triggered by the assigned reading, etc. You will receive 100% credit for "thoughtful effort." If I don't think you've put in thoughtful effort, you will receive 50% credit.

Twitter logistics: On all of your tweets, add the hashtag "**#sustainable_engineering**" at the end so your classmates can find them (and so you can get credit). Every time you tweet an epiphany, you should also scan through all of your classmates' epiphanies on that topic and retweet your favorite. Your goal is to make your epiphany the one that is retweeted the most! Also sign up to follow my research group @bilecbese to get my tweets (you can unfollow me at the end of the semester).

Exams 1 and 2

You will have two exams.

Policies

No cell phones will be allowed during class. I think their presence may be distracting, and a blanket policy is easier to enforce.

Plagiarism

Collaboration is working together to frame a problem and create a solution, discussing results, and analyzing the process. All members of the group contribute, understand the process, and are prepared to complete a similar problem afterward. For individual assignments, individual submissions are required and should NOT be the copied from one another. Cheating is copying someone else's work and handing it in as your own work, and is unacceptable. Plagiarism is using someone else's published work and not giving them credit. Several web sources or the library have guidelines for referencing work from published journals, books, or newspapers, and from websites. Cheating and plagiarism will be handled according to university policies.

ABET LEARNING OUTCOME	ADDRESSED IN THIS COURSE?	ASSESSMENT
(a) an ability to apply knowledge of mathematics, science, and engineering	Addressed	-Chapter 1, HW 1 and Quiz 1 -Chapters 9 and 10, HW 6 -Exam 1
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	Not Addressed	
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	Addressed	-Chapter 7, HW 2 and Quiz 2 -Chapter 8, HW 4 and Quiz 4 -Chapter 9, HW 6 -Chapter 11, HW 8 -Exam 1 -Exam 2
(d) an ability to function on multi-disciplinary teams	Not Addressed	
(e) an ability to identify, formulate, and solve engineering problems	Addressed	-Chapter 8, HW 4 and Quiz 4 -Chapter 9, HW 6 -Exam 1 -Exam 2
(f) an understanding of professional and ethical responsibility	Addressed	-Chapter 1, HW 1 and Quiz 1 -Chapter 7, HW 2 and Quiz 2 -Chapter 6, HW 3 and Quiz 3 -Chapter 8, HW 4 and Quiz

		4 - Exam 1
(g) an ability to communicate effectively	Addressed	-During all in class activities
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	Addressed	Students learn these concepts through the entire course, as they are inherent to sustainability. - Chapter 1, HW 1 and Quiz 1 -Chapter 7, HW 2 and Quiz 2 -Chapter 6, HW 3 and Quiz 3 -Chapter 8, HW 4 and Quiz 4 -Chapters 9 and 10, HW 6 -Chapter 11, HW 8 -Exam 1 -Exam 2
(i) a recognition of the need for, and an ability to engage in life-long learning	Addressed	Students recognize the need for life-long learning since the field of sustainability is evolving. -Chapter 7, HW 2 and Quiz 2 -Chapter 6, HW 3 and Quiz 3 - Chapter 11, HW 8 -Exam 1 -Exam 2
(j) a knowledge of	Addressed	Students learn these

contemporary issues		concepts through the entire course, as they are inherent to sustainability. -Chapter 1, HW 1 and Quiz 1 -Chapter 6, HW 3 and Quiz 3 -Chapter 11, HW 8 -Exam 1 -Exam 2
k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	Addressed	-Chapter 11, HW 8 -Exam 1 -Exam 2