

Syllabus: EES 8060 – Process and Facility Design for Environmental Control Systems: Introductory Module

Time: T,Th 3:30 – 4:45pm
Location: Rich Lab 150
Instructor: Michael Carbajales-Dale
Assistant Professor, EEES
161 Rich Lab, Research Park
864-646-0523
email: madale@clemson.edu
(I will try to respond within 24hrs)
Office hours: 1 hr before class (location Rich Lab 161)

Course Description:

Integration of unit operations into complex systems for treatment of industrial/domestic water and wastewater, contaminated groundwater or air, landfill leachate and toxic liquid wastes. Student teams design an integrated system for either water/wastewater or a hazardous/toxic waste. Offered fall semester only. Preq: EES 8030 or EES 8040.

Topics include multi-criteria decision analysis framework and evaluation of tradeoffs; engineering economics; environmental decision making; as well as project organization and report preparation.

Resources:

Additional readings and handouts will be posted periodically on Blackboard. You should read the appropriate material *before coming to class*. It is recommended that you bring these materials to class in either electronic or paper format. A guide to writing for environmental engineers has been written by Tchobanoglous & Leverenz (2013) [A Guidance Manual on the Preparation of Technical Reports, Papers, and Presentations](#).

Tentative course outline (subject to change)

	Topic	Homework posted
Aug 18	Decision making framework	1
Aug 23-25	Project organization & report writing, Tradeoff evaluation	2
Aug 30-Sept 6	Tradeoff evaluation, Engineering economics	3
Sept 8-13	Environmental decision making	4

Attendance:

Attendance in class is expected unless exceptional circumstances (sickness, personal issues) prevent. This should be discussed with either the instructor, preferably before the class to be missed.

Assignments:

Homework will be assigned most weeks (normally Thursday) and will be due electronically the following week the same day as assigned, before the beginning of class. Homework content will include working on group projects, undertaking analysis based on content from lectures.

Group Project:

The main assignment of this module is a team assignment that should involve all the skills covered in this class. A written report will be required. These will be completed as part of weekly homework and the final report will be due by Sept 15th.

Grading Rubric:

Writing Rubric

1. Below Expectations	2. Progressing toward Criteria	3. Meets Criteria	4. Exceeds Criteria
<ul style="list-style-type: none"> • Inconsistent or few details to support argument • Little or no organization • Limited or inappropriate word choices • Does not use standard English • Poor spelling 	<ul style="list-style-type: none"> • Has some supporting information, but include extraneous material • Not well organized or complete • Limited word choices that may not be appropriate for audience • Often does not use standard English • Many misspelled words 	<ul style="list-style-type: none"> • Provides adequate support for argument. • Organization is generally logical and conveys completeness • Uses effective language; uses appropriate word choices for audience • Generally uses standard English and correct spelling 	<ul style="list-style-type: none"> • Provides ample supporting detail for argument • Organization is logical and complete • Uses effective language; uses appropriate word choices for audience • Consistently uses standard English and correct spelling

Spelling will not be deducted for examinations except when the word is properly spelled in the question.

Problem Solving Rubric

1. Below Expectations	2. Progressing toward Criteria	3. Meets Criteria	4. Exceeds Criteria
<ul style="list-style-type: none"> • Symbols are not defined • Little organization • Numbers are substituted into the equations prior to algebraic operations • Units are not used • Spreadsheet is used with no units or hand calculation • Answers are difficult to find 	<ul style="list-style-type: none"> • Symbols often not defined • Not well organized or complete • Equations are sometimes solved for the independent variable prior to substituting numbers • Units are sometimes used shown for numbers and reduced • For spreadsheet solutions, one example is sometimes worked in detail by hand • The final answer is sometimes underlined or boxed 	<ul style="list-style-type: none"> • Symbols are generally defined Organization is generally logical and conveys completeness • Equations are usually solved for the independent variables prior to substituting numbers • Units are usually shown for numbers and reduced to the final units • For spreadsheet solutions, one example is sometimes worked in detail by hand • The final answers are usually underlined or boxed 	<ul style="list-style-type: none"> • Symbols are defined • Organization is logical and complete • Equations are solved for the independent variables prior to substituting numbers • Units are always shown for numbers and reduced to the final units • For spreadsheet solutions, one example is worked in detail by hand • The final answers are underlined or boxed • Problems with multiple parts are summarized in a table

ABET Accreditation:

Engineering programs must demonstrate that their graduates have:

- a) an ability to apply knowledge of mathematics, science, and engineering
- b) an ability to design and conduct experiments, as well as to analyze and interpret data
- 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
- d) *an ability to function on multidisciplinary teams***
- e) an ability to identify, formulate, and solve engineering problems
- f) *an understanding of professional and ethical responsibility***
- g) *an ability to communicate effectively***
- h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i) a recognition of the need for, and an ability to engage in life-long learning
- j) a knowledge of contemporary issues
- k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

This course focuses on ***emphasized*** items.

Policies:

- Attendance at regular scheduled class meetings is expected as well as participation in class discussions.
- In the event of an unplanned absence by the professor, class will be cancelled after 15 minutes
- Academic honesty is expected. Any violation of Clemson University policy as described in the Student Handbook will not be tolerated and may result in a failing grade.
- Use of electronic devices will not be permitted during class, except for the purposes of taking notes.
- Any exam that was scheduled at the time of a class cancellation due to inclement weather will be given at the next class meeting unless contacted by the instructor.
- Class cancellation due to inclement weather will not affect the deadline for electronic submission of homework or project assignments.
- Any extension or postponement of assignments or exams must be granted by the instructor via email or Canvas within 24 hours of the weather related cancellation.

Academic Integrity:

As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.

Accommodations for students with disabilities:

Students with disabilities requesting accommodations should make an appointment with Dr. Margaret Camp (656-6848), Director of Disability Services, to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Title IX statement:

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at <http://www.clemson.edu/campus-life/campus-services/access/title-ix/>. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 111 Holtzendorff Hall, 864-656-3181 (voice) or 864-565-0899 (TDD).