ENV 4341
Solid and Hazardous Waste Management
Instructor: Dr. Debra R. Reinhart, P.E., DEE

Contact Information		Contacting the Class	
Office Hrs:	T & F 9:00-12:00	**Course Web Site:**	http://msw.cecs.ucf.edu/index.html http://reach.ucf.edu:8900/
Office:	ENG II 202G	**E-Mail:**	reinhart@mail.ucf.edu
Phone:	407-823-2156	**FAX:**	(407) 823-3315

Description: Engineering design, planning, and analysis of problems associated with storage, collection, processing, and disposal of solid and hazardous wastes.

Course Objective: Exposure to regulation of solid and hazardous wastes; engineering design, planning and analysis of solid waste management facilities

Course Outcomes:

- Students will solve problems that address engineering economics issues such as life-cycle analysis and the selection of alternatives.
- Students will solve problems involving topics from chemistry such as stoichiometry, kinetics, equilibrium and gases.
- Students will be exposed to the role of an engineer involving ethics, professionalism, engineering practice and registration.
- Students will demonstrate an ability to communicate their ideas effectively through written and oral reports.
- Students will demonstrate that they have worked in teams to solve engineering problems.
- Students will be exposed to real-world problems and solutions.

Web Site: ENV 4341 is a web-enhanced course. Course materials are found at http://msw.cecs.ucf.edu/index.html. Students will be responsible for material posted on the web site.

Pre-Requisites: ENV 3001

Credit: 3 semester hours

Text: (1) Solid Waste Engineering , Vesilind, Worrell, Reinhart, 2001, (2) *RCRA Orientation Manual 2006*, US EPA, http://www.epa.gov/epaoswer/general/orientat/

Technology Requirements:

Technology	Expectations for Use
E-mail:	I will respond to emails within 24 hours whenever possible. Responses will usually be made to the entire class
WebCT:	WebCT is used for grade management
Special tools:	The Learning Tool will provide in class exercises, notes, and presentations (http://msw.cecs.ucf.edu/index.html)

Evaluation:	Exams (highest 2 out 3)	40%
	Final	25%
	Policy Paper	10%
	Homework	10%
	Case Study/Presentation	15%

Grading: A: 93-100; A-: 90-92; B+: 87-89; B: 83-86; B-: 80-82; C+: 77-79; C: 73-76; C-: 70-72; D+: 67-69; D: 60-66; F: <59

Homework: Four homework assignments will be provided via email. Students are encouraged to work together on this homework but mastery of the material is a personal responsibility. The percent completion of in-class assignments will be used as one homework grade. These in-class assignments can be found at http://msw.cecs.ucf.edu/index.html.

Case Study: In groups of 4-5 students, a case study will be prepared for a local industry managing hazardous waste. One report will be generated per group. The group will be responsible for selecting a site and scheduling an on-site visit. The case study is due 11/20/08 and 10-minute presentations will be given on 12/2/08. The study will describe the facility, a process flow diagram showing where hazardous wastes are generated, waste minimization efforts, quantity and quality of the wastes, and how the wastes are stored, packaged, transported, and disposed.

Late Work: Any missed or late work, exams, etc. WILL NOT BE MADE UP unless an emergency or unavoidable cause can be identified and approved by instructor.

Student Responsibility: Students are expected to attend all scheduled class periods, any work (test or projects) that is not your own will result in an "F" for the course.

Plagiarism Statement: Plagiarism of any kind will not be tolerated. Every student is expected to do their <u>own</u> work and all of the work produced will be expected to be completed in its entirety by the students who turned them in. Any acts of plagiarism will result in an immediate failing grade in the course.

COURSE OUTLINE

Week	Date	Topic
1*	8/26	HW and MSW Introduction
2	9/2	Waste Characterization/Generation
3	9/9	Waste Generation/Life Cycle Analysis
4	9/16	Exam 1/ Risk Analysis
5	9/23	MSW Collection
6	9/30	MSW Collection
7	10/7	MSW Collection /MSW Transfer stations
8	10/14	MSW Processing/ Exam 2
9	10/21	Recycling/Composting/Landfills
10	10/28	Landfills
11	11/4	Landfills
12	11/11	Veteran's Day/Waste Conversion Processes
13	11/18	Exam 3/Waste Conversion Processes
14	11/25	Waste Conversion/Thanksgiving
15	12/2	Group Presentations/Wrap up

*Late registration and Add/Drop ends August 29, 2008
**Withdrawal Deadline October 17, 2008, Final Exam: December 11, 2008, 1:00 pm – 3:50

The UCF Creed

Integrity, scholarship, community, creativity, and excellence are the core values that guide our conduct, performance, and decisions.

Integrity	I will practice and defend academic and personal honesty.
Scholarship	I will cherish and honor learning as a fundamental purpose of my membership in the UCF community.
Community	I will promote an open and supportive campus environment by respecting the rights and contributions of every individual.
Creativity	I will use my talents to enrich the human experience.
Excellence	I will strive toward the highest standards of performance in any endeavor I undertake.

This syllabus may be modified at the discretion of the instructor. Changes will be discussed in class and/or via email

Policy Paper Assignment

A policy paper is generally prepared to express educated views and opinions on major technical, professional and educational issues on behalf of special interest groups. For example, the American Society of Civil Engineers has 155 policy statements approved by the Board of Directors. The paper will be due October 14. I have provided for your use two "typical" policy statements. The following criteria are provided.

1. The paper will be two-three pages, single-spaced, 12-pt font. Hard and electronic copies will be submitted. Use language understandable to the general public; define terms. The paper will be organized into sections with **headings:** Policy, Issue, and Rationale.
    a. Policy – This section is a strong statement of a desired action. Use words such as recommend, should, must, need, support, etc
    b. Issue – Explain why you believe in the policy; why it is needed; what controversies exist.
    c. Rationale – This section is where you back up the policy and issue with facts that explain your position. Use recent citations from journal articles or web sties. Do not directly quote information; rather information should be synthesized into original text. The citation in the text should include the author(s) last name and the year of the publication (not the page).
2. The paper will be returned with edits. You must correct edits and resubmit or you will receive a 0 on the assignment.
3. Any work that is not your own will result in an "F" for the course. I will use web tools available to check for plagiarism.
4. References should be identified (only for those cited in the paper). A minimum of five references is required; preferably peer-reviewed articles (limit web sources that are not peer reviewed to two references). The following should be used as guidance for citations:

    Al-Yousfi, A. B. (1992) *Modeling of Leachate and Gas Production and Composition at Sanitary Landfills.* PhD Dissertation, University of Pittsburgh, Pittsburgh, PA.

    Anex, R.P. (1996) Optimal Waste Decomposition- Landfill as Treatment Process. *Journal of Environmental Engineering*, ASCE, **122**(11) 964-974.

    Blakey, N.C., K. Bradshaw, P. Reynolds, & K. Knox (1997) Bio-Reactor Landfill-A Field Trial of Accelerated Waste Stabilization. Proceedings from Sardinia 97, Sixth International Landfill Symposium, Volume I, S. Margherita di Pula, Cagliari, Italy, 13-17 October, 1997, 375-386.

    Clarke, W. P (2000) Cost-Benefit Analysis of Introducing Technology to Rapidly Degrade Municipal Solid Waste. *Waste Management & Research*, **18**(12), 510-524.

    Reinhart, D. R. & T. G. Townsend (1997) *Landfill Bioreactor Design & Operation*. Lewis Publishers, Boca Raton, FL.

5. Suggested topics include the following, other topics should be approved by Dr. Reinhart:

a. Solid waste carbon market
b. Life cycle analysis
c. Emerging waste conversion technologies
d. Legislative mandate for use of recycled materials by industry
e. Management of electronic wastes
f. Integrated waste management
g. Recycling vs. disposal in landfill or incineration
h. Use of life cycle analysis for waste management decision making (see text Ch 9)
i. Regional vs. local waste management
j. Controlling interstate transport of waste
k. Tax credit for waste derived energy (landfill gas or combustion)
l. Pay-as-you throw approach to waste charging.
m. Use of alternative fuels for waste collectors
n. Crediting waste reduction or recycling to measure recycling achievements
o. Crediting composting to measure recycling achievements
p. Composting vs. landfilling
q. Composting vs. incineration
r. Flow control
s. Space litter

Example Policy Statement

GLOBAL CLIMATE CHANGE

Policy

This writer supports continued research on global climatic change. We recommend that policy makers seek the participation of the engineering community during the development and implementation of national policy and research agenda on global climatic change. Resulting programs should incorporate the principles of engineering and sustainable development.

Issue

Predictions of climate change are usually based on theoretical models of the global climate. Recent data indicate that increases in temperature during the 20^{th} century were due**,** in part**,** to human activity.

Rationale

There needs to be continued international cooperation through which global atmospheric and climatic data can be collected. The scientific and engineering communities need to continue to expand studies, scholarly discussion, public outreach and improved quantitative modeling. Additionally, they need to develop solutions and to participate in policymaking.

Example Policy Paper

ROADWAY RUNOFF WATER-QUALITY MANAGEMENT

Policy

The writer supports the need to regulate urban area and highway stormwater runoff water-quality for protection of public health and the environment. I (We) support elimination of point-source discharge requirements for roadway stormwater runoff based on the adoption of guidelines for stormwater-quality in a strengthened Nonpoint-source Management Program. These nonpoint-source regulations must focus on receiving waters and their watersheds, define pollutants in stormwater runoff in terms of significant impairment to the beneficial uses of a receiving water, and incorporate the control of pollution from stormwater runoff to the maximum extent practicable (MEP) as defined through a community planning process, using best management practices (BMPs).

Issue

In 1987, the Clean Water Act was amended to strengthen the regulation of stormwater-quality protection. However, the 1987 Amendments expanded the definition of point-source to include stormwater runoff which differs from traditional point-sources regulated under the National Pollution Discharge Elimination System in that stormwater discharges are characterized by dispersed discharges and episodic flows.

The attempt to apply water-quality standards developed for point-sources to stormwater runoff has caused confusion and inappropriate regulation of stormwater-quality. The attempt to regulate chemical constituents that are non-toxic and non-available to aquatic life and the application of technologies or BMPs prematurely without adequate assessment and validation have led to unnecessary expenditures of much needed funds and a loss of public confidence.

Urban area and highway stormwater runoff impact the designated beneficial uses of the receiving waters for the runoff. An effective program will, over time and within available resources, reduce the sources of constituents of anthropogenic origin that have negative impacts on receiving waters. Negative impacts are defined as reductions in the quality of the biota and a reduced ability for those waters to be used in beneficial ways by society. This requires that progress be measured by examining the receiving waters in biological and other water-quality use impairment terms rather than through proxy chemical sampling. Regulatory approaches should focus on using existing evaluation procedures and developing better procedures with increased precision, methods of interpreting how the constituents impact receiving waters and the interrelationships between constituents and the aquatic life resources and other beneficial uses of the receiving water.

Rationale

It is recognized that there are limited resources available for the pursuit of stormwater-quality mitigation and believes that current regulations have resulted in over-regulation and over-consumption of public and private funding resources.

It is further recognized that stormwater runoff is different from traditional wastewater point-source discharge and that not all stormwater runoff contains chemical constituents that actually cause pollution of the runoff receiving waters. Stormwater runoff water-quality regulation is currently in flux. There is a need for additional research to provide a sound basis for effective regulation. It is prudent to focus the limited resources available for stormwater-quality mitigation on the most acute water-quality use impairment problems in the receiving waters rather than on the application of either broad-based controls or water-quality standards that may not provide the intended environmental protection.

Highway and urban area stormwater runoff water-quality management programs and regulations should, to the maximum practicable extent, embrace non-structural control measures as the most effective means of controlling pollution in the receiving waters and achieving appropriate water-quality standards through the application of BMPs. Stormwater-quality monitoring programs and the application of BMPs should be developed with clearly defined objectives for water-quality management that can be verified. Careful attention should be given to whether the constituents in stormwater runoff are in chemical forms for a sufficient duration to adversely impact aquatic life and other beneficial uses of the receiving waters for the runoff. Stormwater-quality evaluation and management programs, including BMP efficacy assessment, should be developed to focus on water-quality use impairments in the receiving waters for the runoff.