

**Course Syllabus**  
**CE 454/554 HAZARDOUS WASTE 3 Credit Hours**  
**Fall 2013**  
**Peninsula Graduate Center and ITV Centers**  
**7:10 to 9:50 PM Thursday**

**Instructor:** Dr. Mujde Erten Unal  
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**Office Hours:** Monday: 3:30 PM – 5:30 PM  
Wednesday: 3:30 PM – 5:30 PM or by appointment

**Course Description**

This course involves the study of the source, generation rates, and characteristics of hazardous wastes and their regulation, handling, treatment, and disposal. The course will emphasize on engineering process design, analysis and evaluation of different hazardous waste treatment technologies. Students will have the opportunity to study issues, processes, and problems involved in current hazardous waste treatment and management systems.

**Course Objectives**

The objectives of this course are to:

- (a) familiarize students with laws and regulations governing hazardous waste storage, transport and treatment
- (b) provide an introduction to different pollution prevention and waste minimization opportunities for hazardous waste
- (c) identify environmental concerns for hazardous waste on water, land and air
- (d) to offer necessary equations and design examples to evaluate the effectiveness of different physicochemical, biological and thermal treatment technologies for hazardous waste
- (e) identify containment technologies and land treatment techniques for hazardous waste
- (f) provide experiences in realistic civil and environmental engineering design and construction practice
- (g) evaluate risks associated with exposure to different sources of hazardous wastes
- (h) develop a term project analyzing a case study or a treatment process in hazardous waste treatment

**Course Text**

Hazardous Waste Management, Michael LaGrega, Phillip L. Buckingham, Jeffrey C. Evans, and the Environmental Resources Management Group. Waveland Press, Second edition (2001).

*13-digit ISBN: 978-1-57766-693-6*

*10-digit ISBN: 1-57766-693-3*

## **Grading**

Exam I:	35%
Exam II:	35%
Project:	12% 15
Homework:	18% 15

## **Make-Up Examinations**

Make-up examinations are given only if circumstances warrant it. All make-ups are given in the testing center.

## **Term Project**

Students will select a case study topic dealing with remediation of a hazardous waste site, or with a treatment or disposal process. A list of possible topics projects is attached. Students should indicate their preferences by **October 10**. The paper should include information regarding to the treatment method or remediation technology used to overcome the hazardous waste problem, analyze the design and operating aspects of the specific case, and summarize their findings and observations.

The final report should be approximately ten (10) typewritten pages and will approximately follow a format which is shown below as close as possible:

- I. Introduction and Background
- II. Problem Statement (Definition of the Problem)
- III. Solution and Results
- IV. Conclusions and Recommendations

On December 12, **an electronic copy** of the written report describing the case study and its analysis must be uploaded on Blackboard. **Only electronically uploaded copies to Blackboard through Safe Assign will be accepted.**

## **Possible Topics for the Term Projects**

### **Remediation Cases**

- Bio-Treatment Site Remediation
- Bioremediation, Fungal or Bacterial
- Oil or Gasoline Spill Remediation
- Petrochemical Site Remediation
- Stabilization and Delisting
- Battery site Remediation
- Underground Tank Remediation

PCB Dredging Sediments Containment

PCB Dredging Extraction

Site Remediation

### **Treatment Technology**

Landfill Reclamation

Landfill Gas Recovery

Landfill Leachate

Incineration - Emission Control

Incineration with Energy Recovery

Rotary Incineration Systems

Fluidized Bed Incineration systems

Soil and Ground Water Volatile Organic Contaminant Stripping/Extraction

Solvent Extraction Treatment

Reverse Osmosis Treatment

Ultrafiltration Treatment

Oil Spill Treatment - Marine Environment

Oxidation Reduction of Refractory and Hazardous Organics

Plasma Arc and Furnace Vitrification

Removal of Metals from Groundwater

Aquifer Remediation

Medical Waste Treatment

Any other topic that may be related to the context of the course will also be accepted.

## CE 454\554 Hazardous Waste Tentative Course Schedule

<u>Date</u>	<u>Chapter</u>	<u>Subject</u>
Aug. 29	1, 2	Introduction to hazardous wastes, hazardous waste characterization and the regulatory process.
Sept. 5	3, 4	Process fundamentals. Fate and transport of contaminants.
12	7, 8	Facility development and operations. Waste minimization and resource recovery, waste reduction, waste tracking systems.
19	9	Introduction to physico-chemical treatment processes.
26	9	Physico-chemical treatment processes.
Oct. 3	9	Physico-chemical treatment processes.
10	10	Introduction to biological treatment processes. <b>Selection of Term Project Topics</b>
<b>17</b>		<b>Exam I</b>
<b>24</b>	10	Biological treatment processes
31	11, 12	Stabilization and solidification. Introduction to thermal processes: chemistry and thermodynamics of incineration.
Nov. 7	12	Thermal Processes: Incineration standards and incineration systems.
14	13	Land disposal: disposal site, landfill operations, leachate collection, facilities design and development.
21	13, 14	Land disposal: disposal site, landfill operations, leachate collection, facilities design and development. Introduction to risk assessment.
<b>28</b>		<b>Thanksgiving Holiday</b>
Dec. 5	14, 16	Quantitative risk assessment. Remedial investigations, containment and alternative analysis.
<b>12</b>		<b>Final Exam</b> <b>Final Term Projects due to be submitted/uploaded on Blackboard</b>