

# **EESD15H3 - CLEANING UP OUR MESS: REMEDIATION OF TERRESTRIAL AND AQUATIC ENVIRONMENTS 2012-13**

**Instructor:** Dr. Silvija Stefanovic

**Office:** PO104 room #109

**Email:** silvija.stefanovic@utoronto.ca

**Dr. Stefanovic office hours:** by appointment

**LECTURE:** Fridays from 12-3pm in room BV 264 (schedule of topics & readings on pg 2)

## **COURSE DESCRIPTION**

This course consists of a study of the ways in which hazardous organic and inorganic materials can be removed or attenuated in natural systems. The theory behind various technologies, with an emphasis on bioremediation techniques and their success in practice. An introduction to the unique challenges associated with the remediation of surface and ground water environments, soils, marine systems, and contaminated sediments.

## **COURSE PREREQUISITES**

Students must have successfully completed BGYA01H & BGYA02H & CHMA10H & CHMA11H & PHYA10H or PHYA11H

## **TEXTBOOK**

"Fundamentals of Site Remediation" by John Pichtel, 2007, The Scarecrow Press, Inc.  
This text is available from the UT Scarborough bookstore.

## **GRADE BREAKDOWN:**

Presentation (Types of contaminants):	10%
Term assignments (2)	5% (2x2.5%)
Final Project (Case study):	25%
Project presentation	10%
Final Examination:	50%

## **LECTURE NOTES**

The lecture slides will be posted in \*.pdf format on the intranet. You will require Adobe Reader to open the files (available free of charge at [www.adobe.com](http://www.adobe.com)).

## **FINAL EXAM**

The final exam will draw from lectures and student's presentations and includes lecture notes and *any* material presented in the classroom. Information from the textbook and other resources not directly covered in class will not be tested on exams. More details about the exams will follow.

## **COURSE EMAIL POLICY**

Email is not an effective way of teaching and email inquiries regarding course materials will not be answered. You need to send me an email and we will set up a time on your and my convenience to discuss any question you have.

## LECTURE SCHEDULE

Date	Topic	Associated Readings in Textbook
September 14 <sup>th</sup>	Course orientation Introduction to Soil and Groundwater Remediation	Lecture notes
September 21 <sup>st</sup>	Basic Soil and Groundwater Properties (review)	Lecture notes Chapter 1&4
September 28 <sup>th</sup>	Natural attenuation. Environmental Site Assessment	Lecture notes Chapter 5
October 5 <sup>th</sup>	Student's presentations (Types of Contaminants)	Handouts Chapter 2&3
October 12 <sup>th</sup>	Groundwater Remediation: Introduction and Investigative methods	Lecture notes Chapter 5
October 19 <sup>th</sup>	Groundwater Remediation: <b>Physical Methods;</b> <b>Ex-Situ Technologies;</b> <b>In-Situ Technologies.</b>  Case Histories	Lecture notes Chapter 6&10
October 26 <sup>th</sup>	Groundwater Remediation: <b>DNAPLs Remediation Methods;</b> <b>LNAPLs Remediation Methods.</b> <b>Oil spills Remediation Methods</b> Case Histories	Lecture notes only
November 2 <sup>th</sup>	Soil Remediation: <b>Phytoremediation,</b> <b>In-situ and Ex-situ Thermal Treatments.</b>  Case Histories	Lecture notes Chapter 12
November 9 <sup>th</sup>	Soil Remediation: <b>Chemical and Biological Reaction</b> <b>Solidification and Stabilization</b>  Case Histories	Lecture notes Chapter 8&11
November 16 <sup>h</sup>	Soil Remediation: <b>Soil Vapor Extraction;</b> <b>Soil Washing and Solvent Extraction.</b>  Case Histories	Lecture notes Chapter 7&9
November 23 <sup>th</sup>	Student's presentations (Case studies)	
November 30 <sup>th</sup>	Student's presentations (Case studies) Final Review	

*I will follow this schedule as closely as possible, but things being what they are, some of these topics may "overflow" over into other time slots.*

## FURTHER READINGS

Evan K. Nyer (1998). *Groundwater and soil remediation: practical methods and strategies*. Chelsea, Mich. : Ann Arbor Press.

Alok Bhandari ... [et al.]. (2007). *Remediation technologies for soils and groundwater sponsored by Remediation Technologies for Soils and Groundwater Task Committee of the Environmental Council, Environmental and Water Resources Institute (EWRI) of the American Society of Civil Engineers*. Reston, Va.: American Society of Civil Engineers

Ellen L. Kruger, Todd A. Anderson, Joel R. Coats (1997). *Phytoremediation of soil and water contaminants*. Washington, DC: American Chemical Society.

Juana B. Eweis (1998). *Bioremediation principles*. Boston : WCB/McGraw-Hill.

Franklin J. Agardy and Patrick J. Sullivan (2009). *Environmental engineering. Water, wastewater, soil, and groundwater treatment and remediation*. 6th ed. Hoboken, N.J.: Wiley.

Evan K. Nyer (1993). *Practical techniques for groundwater and soil remediation*. Boca Raton: Lewis Publishers.

Seever, William J. Lehr, Jay H. Hyman, Marve. (2001). *Handbook of Complex Environmental Remediation Problems*. McGraw-Hill Professional.