MEMORIAL UNIVERSITY OF NEWFOUNDLAND
FACULTY OF ENGINEERING AND APPLIED SCIENCE

ENGI 9621 Soil Remediation Engineering

TERM:  Spring 2012

INSTRUCTOR:  Dr. Baiyu (Helen) Zhang
EN-3024, Tel. 864-3301, Email: bzhang@mun.ca

LECTURES:  2:00 - 5:00 PM, Monday, EN-4008

OFFICE HOURS:  Morning, Monday to Friday. You’re welcome to try my office any time or send me an email.

COURSE WEBSITE:  http://www.engr.mun.ca/~baiyu/en9621.htm
Lecture notes and assignments, as well as important notices regarding the course schedule and the deadlines, will be posted on this web site. Please do check it frequently and especially before you go to classes.

DESCRIPTION AND OBJECTIVES:  The overall goal of this course is to introduce students to broad and practical insight to the various soil remediation technologies used to address different environmental conditions. Within the context of the overall goal, technical mechanisms, strengths and limitations as well as the practical details of each soil remediation technology will be tackled. At the end of the course, students should be able to gain direct, comprehensive and full of valuable information, from the fundamentals to advanced principles, and from basics to the latest updates in soil remediation technologies and approaches.

TEXTBOOKS:  None required. Handouts will be distributed in class, and/or from the course web site.

TEXTS RELEVANT TO THE COURSE:

SITE VISIT:  Robin Hood Bay Landfill Site, Tour of Contaminated and Remediated Sites in St. John's.
### OUTLINE OF TOPICS:

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<td>Characteristics and Partitioning of Contaminants</td>
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<td>Pump and Treat</td>
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### GRADING SCHEME:

1) Assignments 15%
2) Term Paper 35%
3) Presentation 15%
4) Final Exam 35%

1) **Assignments (15%)**
   - Students are required to submit three assignments during the course.
   - Assignments to be marked are due in class on the assigned due date.
   - Each assignment is worth 100 points. Five points will be deducted for each day that an assignment is late.
   - The final grade will be an average over all the assignments.

2) **Term Paper (35%)**
   - Students are required to submit a term paper related to this course by **August 3rd, 2012 (tentative)**. The possible topics should focus on one of the following areas:
     - Soil remediation engineering technologies, historic aspect of view;
- Methods for screening of applicable remediation technologies for a specific contaminated site;
- Innovative technologies for soil remediation engineering practice and research;
- Reports on your own research experience for a specific case.

- Students are required to submit a brief proposal at least 4 weeks ahead of the deadline. The proposal should include the paper title, abstract, and outline, as well as your name and affiliation). One example of acceptable proposal is shown below:

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**Application of bioemulsifiers in soil oil bioremediation processes. Future prospects**

C. Calvo, M. Manzaneraa, G.A. Silva-Castroa, I. Uada and J. González-Lópeza
Environmental Microbiological Research Group, Department of Microbiology, Institute of Water Research, University of Granada, C/ Ramón y Cajal no. 4. 18071, Granada, Spain

**Abstract**

Biodegradation is one of the primary mechanisms for elimination of petroleum and other hydrocarbon pollutants from the environment. It is considered an environmentally acceptable way of eliminating oils and fuel because the majority of hydrocarbons in crude oils and refined products are biodegradable. Petroleum hydrocarbon compounds bind to soil components and are difficult to remove and degrade. Bioemulsifiers can emulsify hydrocarbons enhancing their water solubility and increasing the displacement of oily substances from soil particles. For these reasons, inclusion of bioemulsifiers in a bioremediation treatment of a hydrocarbon polluted environment could be really advantageous.

There is a useful diversity of bioemulsifiers due to the wide variety of producer microorganisms. Also their chemical compositions and functional properties can be strongly influenced by environmental conditions.

The effectiveness of the bioemulsifiers as biostimulating agent in oil bioremediation processes has been demonstrated by several authors in different experimental assays. For example, they have shown to be really efficient in combination with other products frequently used in oil bioremediation such as they are inorganic fertilizer (NPK) and oleophilic fertilizer (i.e. S200C). On the other hand, the bioemulsifiers have shown to be more efficient in the treatment of soil with high percentage of clay. Finally, it has been proved their efficacy in other biotechnological processes such as in situ treatment and biopiles. This paper reviews literature concerning the application of bioemulsifiers in the bioremediation of soil polluted with hydrocarbons, and summarizes aspects of the current knowledge about their industrial application in bioremediation processes.

**Keywords:** Bioemulsifier; Biodegradation; Hydrocarbon; Bioremediation

**Article Outline**

1. Introduction
2. Chemical composition
3. Use of biosurfactant in oil bioremediation
4. Future prospects
   Acknowledgements
   References

(Source: Science of The Total Environment, Volume 407, Issue 12, 1 June 2009, Pages 3634-3640)

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- Your purpose is to create NEW knowledge while recognizing those scholars whose existing work has helped you in this pursuit, you are honor bound never to commit the following academic sins:
  - **Plagiarism:** Literally “kidnapping,” involving the use of someone else’s words as if they were your own. To avoid plagiarism you must document direct quotations, paraphrases, and original ideas not your own.
- **Recycling**: Rehashing material you already know thoroughly or, without your professor’s permission, submitting a paper that you have completed for another course.
- **Premature cognitive commitment**: Academic jargon for deciding on a thesis too soon and then seeking information to serve that thesis rather than embarking on a genuine search for new knowledge.

3) **Presentation of Term Paper (15%)**
   - Students are expected to give an oral presentation of their term paper.
   - The oral presentation is usually limited to a **12 minute** presentation of your paper, followed by a **3-minute** question & answer period.
   - Speakers are suggested to use Microsoft PowerPoint. It is an honor to have the opportunity of being in the spotlight with an audience of peers giving you their time and attention. You have an obligation to them (and to your profession) to use that occasion wisely and well.
   - **Recommendations in preparing your talk:**
     - Decide on a limited number of the significant ideas you want your audience to code, comprehend, and remember.
     - Minimize details (of procedure, data analysis, and literature review) when highlighting the main ideas you want to transmit.
     - State clearly in simple, jargon-free terms what the point of the research is, what you discovered, and what you think it means--its conceptual, methodological, or practical value.
     - Employ some redundancy in repeating important ideas to enhance comprehension and recall.
     - Write out your presentation as a mini-lecture (with a listening audience in mind), starting with an outline that you expand into a narrative.
     - Practice delivering it aloud in order to learn it well, to make its length fit in the time allocated, and to hear how it sounds.
     - Do not read your paper. Speak your ideas directly to your audience, referring--if necessary only--to an outline of key points and transitions.
     - Try to speak loud enough, clear enough, and with sufficient enthusiasm to hold the attention of your audience despite distractions (internal and external).
     - State your final conclusions and end on time.
     - Get feedback both from tape-recorded replay of your delivery and from critical colleagues who listen to it.

4) **Final Exam (35%)**
   - Close book
   - In the end of the Spring term