

UNLV COURSE SYLLABUS INFORMATION

GEOL 475-675 - Contaminant Hydrology - Hazardous Site Assessment and Remediation (3 cr.)

Suggested Textbook: Contaminant Hydrogeology by Fetter, Boving and Kreamer, 3rd edition, 2016, Waveland Press.

1. This course is designed to cover the theory, science, engineering, and "nuts and bolts" field approaches to monitoring and cleaning up contaminated sites. Site characterization techniques and cleanup approaches will be discussed, drawing on interdisciplinary state-of-the-science perspectives. Topics will include: types and nature of different pollutants, environmental law and agency guidance, contaminant transport processes and modeling, non-invasive characterization techniques, typical and innovative monitoring, sampling procedures, natural and enhanced degradation, and choosing and implementing effective cleanup approaches.

2. Course Learning / Outcome Objectives

Upon completion of the course, students should have an understanding of:

- A. Selected Regulations and Regulatory Guidance
- B. Types of Sites, and Phase I Assessments
- C. Priority Pollutants, Metals, Pesticides, Non aqueous Phase Liquids (NAPLs)
- D. Chemical Properties - Sorption, Volatilization, and Abiotic and biotic transformations
- E. Movement and transport of contaminants both in the aqueous and non aqueous phases
- F. Site Assessments - Mass Balance
- G. Non-invasive techniques - geophysics, soil gas, aerial photography
- H. Invasive techniques - monitoring wells, sampling
- I. Emergency response
- J. Physical Cleanup - Waste Minimization, Excavation, Physical Barriers, Hydrologic Barriers, Pump and treat
- K. Remedial Design, Packed tower aerators, Carbon Adsorption systems
- L. Biological Remediation and other methods, Sparging, Bioslurp, Vapor Extraction, Surfactants

3. Assessment of these learning/outcome objectives will be based on the midterm (25%) and final exam (35%), homework (20%), one term paper (10%), and one class presentation (10%).

TENTATIVE COURSE OUTLINE

Contaminant Site Assessment and Remediation

Week

- 1 Introduction - Regulations, Types of Sites, Phase I Assessments
- 2 Contaminants - Priority Pollutants, Metals, Pesticides, NAPLs
- 3 Contaminants - Non aqueous Phase Liquids (NAPLs),
- 4 NAPL Chemical Properties, Source Analysis
- 5 Movement and transport - Aqueous Phase, Darcy's Law, Dispersion
- 6 NAPL Movement, Distribution
- 7 Movement and Transport - Nonaqueous phase, Sorption, Volatilization, Abiotic and biotic transformations
- 8 Site Assessment - Mass Balance, non-invasive techniques, geophysics
- 9 Site Assessment - Soil gas, invasive techniques, monitoring wells, sampling
- 10 Remediation - Barriers, Hydrologic Barriers, Pump and treat
- 11 Remediation - Biological, Sparging, Bioslurp, Vapor Extraction, Surfactants
- 12 Remediation
- 13 Remedial Design, Packed tower aerators, Carbon Adsorption systems
- 14 Student Class Presentations
- 15 Student Class Presentations
- 16 Summary and Final Perspectives

Student Class Presentations will be 20 minutes long, with 5 minutes following for questions and answers. These will be done in professional conference style. Overheads, slide projectors, and other audiovisual aids will be available for your presentation.

Differences from Geol 475 are: 1. Additional Homework assignments for graduate 675 level including research of an ongoing field investigation, 2. Longer, more detailed, student class presentations, 3. Longer more detailed term paper requirements, 4. Required assignment involving student external peer reviewer of selected, current pollution events and remediation projects.

9. Term Papers will include: Title page, Abstract, Contents, List of Tables, List of Illustrations, References, and a brief Biographical Sketch of the Author. Proper Referencing must be used. The body of the term paper (not counting figures) should not exceed a length of ten type-written pages.