

**UNLV COURSE SYLLABUS INFORMATION**  
**GEOL 475, GEOL 675, Contaminant Hydrogeology (3 cr.),**  
**Mondays, Wednesdays 5:30-6:45 pm – WRI 311**

**1. Instructor: Dr. David K. Kreamer**

Office hrs. LFG 205 – Monday, Wednesday 3-4pm or after class, and other times by appointment  
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This course is designed to cover the theory, science, engineering, and "nuts and bolts" field approaches to contaminant hydrogeology, 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: pollutant sources, 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. The instructor has worked directly on field sites throughout the nation, has served as an expert witness in court cases involving contamination, and has represented the U.S. Environmental Protection Agency in national lecture series describing the latest methodologies and perspectives in dealing with hazardous sites. Case studies and field pictures from actual sites will be included throughout the course.

**2. Course Learning / Outcome Objectives**

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

1. Review of Groundwater Hydrology
2. Selected Regulations, Laws and Regulatory Guidance
3. Types of Sites, and Phase I Assessments
4. Priority Pollutants, Metals, Pesticides, Non aqueous Phase Liquids (NAPLs), and others
5. Chemical Properties - Sorption, Volatilization, and Abiotic and biotic transformations
6. Movement and transport of contaminants both in the aqueous and non aqueous phases
7. Site Assessments - Mass Balance
8. Non-invasive techniques - geophysics, soil gas, aerial photography
9. Invasive techniques - monitoring wells, sampling
10. Physical Cleanup - Waste Minimization, Excavation, Physical Barriers, Hydrologic Barriers, Pump and treat
11. Remedial Design, Packed tower aerators, Carbon Adsorption systems, time permitting
12. Biological Remediation and other methods, Sparging, Bioslurp, Vapor Extraction, Surfactants

3. Assessment of these learning/outcome objectives will be based for GEOL 475 and 675 on the midterm (25%) and final exam (35%), homework and class participation including quizzes (20%), one term paper (10%), and one class presentation (10%).

4. The purpose of this course is to provide an introduction to actual field techniques and calculations associated with the nature, occurrence, movement, transformation, assessment and remediation of contamination, with an emphasis on groundwater. Student responsibilities include: attending the lectures, taking and maintaining lecture notes to supplement the assigned text readings, completing homework on-time, writing a term paper and, for GEOL 675, giving a class presentation. Examinations are primarily multiple choice, key-term definition and solving calculations; Departmental policy precludes make-up exams.

5. For 475 Class Presentations will be 9 minutes long, with 3 minutes following for questions and answers. For 675 Class Presentations will be 12 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.

6. 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 and a complete plagiarism check must be carried out and submitted with the paper. The body of the term paper (not counting figures) should not exceed a length of five type-written pages for 475, ten pages for 675. Due March 19. Papers will be submitted electronically in Word format.

## 7. Notes will be posted on Web Campus

### Other Stuff

8. Academic honesty / dishonesty matters will be treated in accordance with the Academic honesty/dishonesty statement as printed in the UNLV Undergraduate Catalog.

9. If you have a documented disability that may require assistance, please contact the Disability Resource Center for coordination of your academic accommodations. Students may contact Student Support Services in Room 137 (Reynold's Student Services Complex) or call the DRC 895-0866 (TDD 895-0652).

10. It shall be the responsibility of the student to notify the instructor no later than the last day of late registration of his or her intention to participate in religious holidays that do not coincide with state holidays. This policy shall not apply in the event that administering the examination at an alternative time would impose undue hardship on the instructor or the University, which could not have been reasonably avoided.

11. The University Of Nevada, Las Vegas does not discriminate on the basis of race, color, creed, religion, national or ethnic origin, gender, age, sexual orientation, disability, or veteran status.

12. Students are welcome to use the UNLV Writing Center free of charge. Consultants can assist students at all stages of the writing process. Students may make appointments by calling the center (895-3908) or in person at FDH-240.

## TENTATIVE COURSE OUTLINE - Geology 475 and 675, Spring 2018 Contaminant Hydrogeology

GEOL 475-675 MW 5:30-6:45 pm is a 3 credit course.

### Fetter, Contaminant Hydrogeology, 3<sup>rd</sup> edition Reading Assignment Chaps.

#### Week of:

Jan.	17,22	Introduction - Regulations, Types of Sites and sources, Groundwater hydrology review	<b>1.1-1.7</b>
	29	Contaminants - Priority Pollutants, Metals, Salts, Nutrients Pesticides, Radioactive Elements, PEP compounds, Contaminants - Non aqueous Phase Liquids (NAPLs), Emerging Contaminants (personal care products, trace elements, drugs)	<b>6.6-6.11</b> <b>7.1-7.5</b>
Feb.	5	Chemical Properties, Source Analysis, Solubility, Phase change, Mass Balance, Abiotic and biotic transformations	
	12	Movement and transport - Aqueous Phase, Darcy's Law, Dispersion NAPL Movement, Distribution	<b>1.8 and 2.1-2.10</b>

#### President's day 19

	26	Field example	
March	5	Movement and Transport - Nonaqueous phase, Sorption, Volatilization,	

#### March 7 Midterm Exam

	12	Class Presentations	
	19	Class Presentations	

#### March 19 Term papers due

#### March 26 Spring Break – No Classes

April	2	Corrective Action, Mass Balance, non-invasive techniques, geophysics	<b>All of 8</b>
	9	Soil gas, invasive techniques, monitoring wells, sampling	
	16	Remediation - Barriers, Hydrologic Barriers, Pump and treat	<b>All of 9</b>
	23	Remediation - Biological, Sparging, Bioslurp, Vapor Extraction, Surfactants	
	30	To be assigned	

#### May 9 Final Exam, Wednesday 6 pm – 8 pm

Possible Optional Saturday Sessions TBA – 1. Chemistry and Pollutants, 2. Basic Hydrology  
Optional 40 hour HAZWOPER certification – two weekends.