

## **Environmental Impacts of Land Use and Contaminant Remediation ES 470**

**Class hours:** Tuesday and Thursday 12 noon to 1:15pm in Gerald Thomas Hall 338

**Instructor:** Dr. Kenneth C. Carroll  
Office: Skeen Hall, Rm. N336  
Office phone number: 575-646-5929  
Email: [kccarr@nmsu.edu](mailto:kccarr@nmsu.edu)  
Office hours: by appointment or drop in

**Course description:** Understanding of land use and environmental impact and contamination cleanup through practical case studies and hands on computer modeling.

**Required prerequisites:** ES 256, ES 462, ES 370 AND ES 453 (waived for graduate students and with instructor permission)

### **Recommended textbooks:**

K. Hess. 2007. *Environmental Site Assessment, Phase I: A basic Guide* 3<sup>rd</sup> Edition. Lewis Publishers, Boca Raton FL, ISBN-10: 0849379660 ISBN-13: 978-0849379666

Contaminant Hydrogeology, 2nd Edition, by Fetter, 1999; Environmental Law, by R.W. Findley and D.A. Farber, 2004; Geochemistry, Groundwater and Pollution, by Appelo and Postma, 2005; Other supplemental materials: Supplemental reading supplied in class.

**Course Objectives:** Students will learn to integrate physics, chemistry and biology concepts for the assessment of practical environmental issues based on procedures outlined by agencies such as the EPA, DOD, DOE, USGS, and USDA.

### **Course Overview:**

The course will cover the integrated assessment of soil erosion, contaminant transport in soil and water, and contaminant remediation from site scale to watershed scales. Understanding of the controlling factors for each type land use impact will be gained through the use of risk assessment, case studies, and computer modeling. Case studies will illustrate the processes under various environmental applications. This course will also cover the application of solute transport principles and methods for the remediation of contaminated soil and groundwater. It will also discuss the contaminated site characterization, monitoring, and remediation design. Discussions of innovative methodologies will be supported with case studies. The focus of this course is on team-based project learning. Computer software and models will be used to learn analysis techniques.

### **Course Goals:**

- a. Outcomes of instruction: The primary objective of this course is for students to become familiar with environmental impact analysis and contamination remediation issues, problems, and analysis methods. Another objective is for students to learn critical thinking, problem solving, and reporting skills. The students will learn to apply theories through homework calculations and modeling assignments.
- b. Student Outcomes:

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to function on multidisciplinary teams
- An ability to identify, formulate, and solve science and engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
- The broad education necessary to understand the impact of science and engineering solutions in a global, economic, environmental, and societal context
- A recognition of the need for, and an ability to engage in life-long learning
- A knowledge of contemporary land-use impact and cleanup issues
- An ability to use the techniques, skills, and modern environmental science and engineering tools necessary for current industry practice.

### **Tentative Course contents:**

Overview

Soil Erosion TMDL

Environmental Law

Environmental Impact Statement

Environmental Site Assessment

Soil and Groundwater Contamination

Transport Behavior; Transport Parameters

Field-Scale Transport of Reactive Solutes: Experiments and Models

Soil and Groundwater Contamination Remediation

Site Characterization: Basics, Groundwater Sampling

Site Characterization: Metals and organics investigations

Excavation and Containment/Control

Pump and Treat

Soil Venting and Air Sparging

Monitored Natural Attenuation;

Bioremediation

In-situ Chemical Oxidation and Reduction

Thermal, Electrokinetic, Vitriification, and In-Situ Stabilization

Soil Washing and Enhanced Flushing

Life Cycle: From RI-FS Through Site Closure

### **Grading Criteria:**

Attendance required for all classes. Authorized absences will be allowed when students are representing NMSU at official events or for documented illness (notify instructor in advance). Letter grades will be assigned according to the following:

90-100% - A; 80-89% = B; 70-79% =C; 60-69% = D; <60% = F

Based on:

20% - Class participation (quizzes) and homework

20% - Take-home and in-class assignments (projects)

20% - Midterm exam

20% - Final exam

20% - Term project and report

**General Policies:**

All students are expected to attend class. The instructor must be notified in advance about missing class. Any assignments turned in late will receive grade reductions, and assignments turned in more than 1 week late will not be graded.

**Academic Integrity:** It is expected that students will maintain the highest degree of academic integrity and honesty. Students are expected to complete their own work to the best of their ability, and you are required to be familiar with university policies and procedures in the current NMSU Undergraduate Catalog. Policies and procedures for dealing with such cases are detailed in the Student Handbook <http://www.nmsu.edu/~vpsa/SCOC/index.html>. An explanation of plagiarism can be found here: <http://lib.nmsu.edu/plagiarism/>. Please see the Student Code of Conduct in The Student Handbook: <http://deanofstudents.nmsu.edu/student-handbook/1-student-code-of-conduct/> and pay particular attention to “III.B. Academic Misconduct.” Academic misconduct will not be tolerated and will result in severe penalties including an F in the class.

**Student Accessibility Services**

If you have, or believe you have, a disability and would benefit from accommodations, you may wish to self-identify. Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act Amendments Act (ADAAA) covers issues relating to disability and accommodations. If a student has questions or needs an accommodation in the classroom (all medical information is treated confidentially), contact:

Trudy Luken, Director Student Accessibility Services (SAS) - Corbett Center, Rm. 244

Phone: (575) 646-6840 E-mail: [sas@nmsu.edu](mailto:sas@nmsu.edu)

Website: <http://sas.nmsu.edu/>

NMSU policy prohibits discrimination on the basis of age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, retaliation, serious medical condition, sex, sexual orientation, spousal affiliation and protected veterans status. Furthermore, Title IX prohibits sex discrimination to include sexual misconduct: sexual violence (sexual assault, rape), sexual harassment and retaliation.

For more information on discrimination issues, Title IX, Campus SaVE Act, NMSU Policy Chapter 3.25, NMSU's complaint process, or to file a complaint contact: Gerard Nevarez, Title IX Coordinator  
Agustin Diaz, Title IX Deputy Coordinator

Office of Institutional Equity (OIE)-O'Loughlin House, 1130 University Avenue

Phone: (575) 646-3635 E-mail: [equity@nmsu.edu](mailto:equity@nmsu.edu)

Website: <http://eeo.nmsu.edu/>

Other NMSU Resources:

NMSU Police Department: (575) 646-3311 [www.nmsupolice.com](http://www.nmsupolice.com)

NMSU Police Victim Services: (575) 646-3424

NMSU Counseling Center: (575) 646-2731

NMSU Dean of Students: (575) 646-1722

For Any On-campus Emergencies: 911

If you are already registered with the SSD office and need accommodations please provide your “Accommodation Memo” from the SSD within the first two weeks of class.

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Office of Institutional Equity (OIE) - O'Loughlin House

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Website: <http://www.nmsu.edu/~eeo/>

**Disclaimer**

The instructors reserve the right to modify the course schedule or other aspects of the syllabus during the semester as considered necessary to achieve course objectives. Any necessary changes to the syllabus (or to the course schedule) will be announced in class and you are responsible for being aware of them.