Advanced Soil and Groundwater Restoration GEOL/ESCI 5321
Department of Physical and Environmental Sciences
Spring 2016

A. COURSE INFORMATION
Course number/section: GEOL/ESCI 5321
Class meeting time: M 7-9:30
Class location: EN-107
Course Website: https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION
Instructor: Dr. Dorina Murgulet
Office location: NRC-3103
Office hours: TWR 9:15-10:55
Telephone: 361-825-2309
e-mail: dorina.murgulet@tamucc.edu
Appointments: If possible please attend the office hours. Nevertheless, please send an email to set up an appointment if you cannot meet during the office hours.

C. COURSE DESCRIPTION
Catalog Course Description
Advanced study of methods for restoring contaminated soil and groundwater by examining the factors and processes influencing the efficacy of remediation systems. An emphasis will be placed on the scientific principles upon which soil and groundwater remediation is based.

Extended Course Description
This course will give students the skills to evaluate which technologies and techniques used to remediate soil and groundwater are best suited for different environments, remediation objectives, and particular types of contaminants

D. PREREQUISITES AND COREQUISITES
Prerequisites
GEOL 1403, CHEM 1311/1111, CHEM 1312/1112, GEOL 3443 or equivalents, and/or with instructor’s permission.

Corequisites
N/A

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES
Recommended/Optional Textbook(s)
Environmental and Pollution Science, 2nd Edition; by Pepper, I.L.; Gerba, C.P.; and


**Supplies**

Pencil, ruler, pocket calculator

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**F. STUDENT LEARNING OUTCOMES AND ASSESSMENT**

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1) understand remediation options and design criteria;
2) implement the design of and present a feasibility study for a remedial investigation;
3) understand the factors limiting and controlling cleanup of hazardous pollutants in soil and groundwater;
4) conduct analyses of to determine transport characteristics of chemical in groundwater; and
5) choose appropriate techniques for effective contaminant control, remediation, and restoration.

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**G. INSTRUCTIONAL METHODS AND ACTIVITIES**

**Exams**

Each student is expected to take all exams at the designated time and place. Students who miss an exam will receive a grade of zero for that exam. Make-up exams will be given only on presentation of approved medical excuse, or by pre-excused permission of the instructor. No exceptions! One and only one make-up exam will be given after each regularly scheduled exam. Time and place for the make-up exam will be arranged at the next regularly scheduled class following each exam. The format of make-up exams may differ from that of the regular exam.
All exams are closed book, however, the use of a calculator is permitted. Students who want to appeal a grade should do it in writing, at latest one day after the exam was returned. Please note the date of the final exam. No final exam will be given at an earlier date. Disability accommodations must be documented and approved by the Office of Disability Services.

ASSIGNMENTS

Homework will be assigned throughout the semester. Students are encouraged to work in groups, however each student is expected to submit their own individual work. All homework (problem sets) must be completed by the due date and in a professional manner. Care should be taken to assure that a neat, organized, understandable, and concise product is the result of your work. Late work will not be accepted.

CLASS PROJECT

Students will be required to submit a project report (oral) utilizing the principles learned in class to construct an RI/FS study for a contamination site.

INDEPENDENT PROJECT

Students will be required to submit a synthesis and report (oral and written) related to a specific class of contaminants and discuss appropriate remediation technologies that apply.

H. MAJOR COURSE REQUIREMENTS AND GRADING

Student learning outcomes described in Section F will be measured as follows:

COURSE GRADING

3 Exams {Exam 1 = 15%, Exam 2 = 15%, Final = 15%} + HW {15%} + Project {25%} + Independent Project {15%}.

GRADING POLICY

A: 90-100%;
B: 80-89.9%;
C: 70-79.9%;
D: 60-69.9%;
F: 0-59.9%
I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Week/Date</th>
<th>Content</th>
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| January 25, 2016| 1. Introduction to course  
|                 | 2. Hydrogeology overview                                                |
| February 1, 2016| 1. Hydrogeology overview  
|                 | 2. Contaminant Transport and Distribution                               |
| February 8, 2016| 1. Superfund, Planning, & Evaluation (RI/FS)  
|                 | 2. Site Characterization                                                |
| February 15, 2016| 1. Containment/Control: Barriers, Immobilization Drains, Wells  
|                 | 2. Pump and Treat: Fundamentals                                         |
| February 22, 2016| 1. Pump and Treat: Performance  
|                 | 2. Pump and Treat: Performance/ Pump and Treat: Case Study             |
| February 26, 2016| Exam 1  
|                 | 1. Pump and Treat: Estimating Contaminant Removal Time                  |
| March 7, 2016   | 1. Enhanced Flushing Techniques; Discussion of Term Project             |
|                 | 2. Enhanced Flushing Techniques                                         |
| March 14, 2016  | No class/Spring Break                                                   |
| March 21, 2016  | 1. Enhanced Flushing Techniques  
|                 | 2. Air Sparging, UVB Systems                                             |
| March 28, 2016  | 1. Soil Venting;  
|                 | 2. Enhanced Soil Venting, Steam                                         |
| April 4, 2016   | 1. In-situ Treatment – Physical/Chemical  
|                 | 2. In-situ Treatment – Physical/Chemical                                |
| April 11, 2016  | Exam 2  
|                 | 1. In-situ Treatment – Biological                                       |
| April 18, 2016  | 1. Case Study: NAPL Remediation  
|                 | 2. Pollution Prevention                                                 |
| April 25, 2016  | Class Project Presentations (Graduate)/Independent Project Due          |
| May 2, 2016     | Class Project Presentations (Graduate/Undergraduate)/Class Project Due  |
| May 9th         | Final Exam (7:15-9:45 pm)                                               |

READING: Reading material will be assigned at the end of each lecture session.

*NOTE: The syllabus is subject to change at the instructor’s discretion.

Note: Changes in this course schedule may be necessary and will be announced to the class by
the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

Attendance/Tardiness
All students are expected to attend class. Poor attendance will result in missed lecture material and may reflect in less than desired class performance. It is the students’ responsibility to acquire class notes from peers if class is missed.

Late Work and Make-up Exams
See Section G

Extra Credit
N/A

Cell Phone/Laptop Use
Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. The use of cell phones, pagers, CD players, headphones and similar electronic devices is not allowed in class. Keep these devices in your bags, not on the tables. You may be asked to refrain from using a laptop in class.

Food in Class
N/A

Missed Exam
See section G

Participation
Students are expected to participate in classroom exercises and equally in the class projects.

Others
N/A

K. COLLEGE AND UNIVERSITY POLICIES

• Academic Integrity (University)
University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own
work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation **WILL NOT** automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the Course Drop Form that **must** be submitted. No student is eligible to receive a W without completing the official drop process by this deadline. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html), and the College of
Science and Engineering Grade Appeals webpage at [http://sci.tamucc.edu/students/GradeAppeal.html](http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

  If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

  [http://disabilityservices.tamucc.edu/](http://disabilityservices.tamucc.edu/)

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.