Texas A&M University – Corpus Christi  
College of Science and Engineering  
Department of Physical and Environmental Science  

Advanced Soil and Groundwater Restoration ESCI 6321  
Department of Physical and Environmental Sciences  
Fall 2018  

A. COURSE INFORMATION  
Course number/section: ESCI 6321  
Class meeting time: MWF 10:00am-10:50am  
Class location: OCNR 130  
Course Website: https://bb9.tamucc.edu  

B. INSTRUCTOR INFORMATION  
Instructor: Dr. Dorina Murgulet  
Office location: NRC 3103  
Office hours: MWF 11:00am-12:40pm  
Telephone: 361-825-2309  
e-mail: dorina.murgulet@tamucc.edu  
Appointments: If you are not able to attend the posted office hours, please send an email to set up an appointment.  

I check email regularly and you are encouraged to communicate by email whenever possible. I will usually respond within a few hours, but never more than 24 hours later (except weekends, holidays and previously communicated travel and/or field work).  

C. COURSE DESCRIPTION  
a. Catalog Course Description  
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.  

b. 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  
a. Prerequisites  
CHEM 1311/1111, 1312/1112: General Chemistry I and II with labs  
GEOL 1403: Physical Geology  
GEOL 3443: Environmental Geology  
or equivalents and/or with instructor’s permission
b. **Recommended**
GEOL 4444: Hydrogeology

E. **REQUIRED TEXTBOOK(S), READINGS, AND SUPPLIES**
There is no assigned textbook for this course, but all assigned readings (technical papers, book extracts, and reading assignments from books) will be provided through Blackboard or reserve in the Bell Library.

**RECOMMENDED BOOKS**


**SUPPLIES**
Pencil, ruler, pocket calculator

F. **STUDENT LEARNING OUTCOMES AND ASSESSMENTS**
By the end of this course, students will:
1) Identify the correct government agency and define its role in soil and groundwater remediation from a list of acronyms;
2) Identify the importance of laws for soil and groundwater remediation from a list of the name and year of the law;
3) Perform a site characterization given the site’s known history and chemical, hydrological, and soil analyses;
4) Recognize the differences between remediation options by performing cost/benefit analyses for a minimum of three remediation options each for contaminant containment and control, groundwater remediation, and soil remediation;
5) List the factors limiting and controlling cleanup of hazardous pollutants in soil and groundwater;
6) Perform analyses to determine transport characteristics of chemical(s) in groundwater; and
7) Work in groups to construct a Remedial Investigation/Feasibility Study (RI/FS) for an assigned case study. The RI/FS will include a site characterization, cost/benefit analysis of feasible containment/control and remediation options for soil and groundwater, and a final group recommendation for remediation.

G. **INSTRUCTIONAL METHODS AND ACTIVITIES**
a. **ASSIGNMENTS**
Each Unit will have assigned problem sets and/or quizzes. All problem sets and quizzes 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. Quizzes will be predominantly
qualitative and designed for students to demonstrate their understanding of key Unit
concepts.

b. EXAMS
There will be two midterm exams and one final exam. Midterm exams will cover new
material and will be given at the end of week 5 and week 10. The final exam will be
comprehensive. Students who miss an exam will receive a grade of zero for that
exam. The use of a calculator is recommended. Each student is expected to take all
exams at the designated time, unless prior arrangements have been made with the
instructor. Disability accommodations must be documented and approved by the
Office of Disability Services.

c. CLASS PROJECT
Students will be assigned to project groups. Each group is required to submit a
project report utilizing the principles learned in class to construct an RI/FS study for a
contamination site.

d. INDEPENDENT PROJECT (Graduate Students)
Students will be required to submit a synthesis and report related to a specific class of
contaminants that discusses appropriate remediation technologies that apply.

H. MAJOR COURSE REQUIREMENTS AND GRADING
Student learning outcomes described in Sections F and G will be measured as follows:

a. COURSE GRADING
Assignments: 250 pts.
Exam 1: 100 pts.
Exam 2: 100 pts.
Final Exam: 200 pts.
Class Project: 150 pts.
Independent Project: 200 pts.

TOTAL: 1000 pts.

b. GRADING POLICY
A: 90-100%
B: 80-89.9%
C: 70-79.9%
D: 60-69.9%
F: 0-59.9%

c. LATE WORK
Assignments are due on the dates indicated in the syllabus and schedule. Due dates are
particularly important when someone else is relying on your contributions. Late work
will not be accepted with the exception of prior consultation and approval of the
instructor.
## I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topics</th>
<th>Readings</th>
<th>Activities</th>
<th>Points</th>
<th>Due Dates</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Hydrogeology Review</td>
<td>TBD</td>
<td>• HW#1 Hydrogeology worksheet</td>
<td>20</td>
<td>September 7</td>
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<td>2</td>
<td>Superfund, Planning, &amp; Evaluation (RI/FS)</td>
<td>TBD</td>
<td>• HW#2 Agencies worksheet</td>
<td>20</td>
<td>September 19</td>
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<td>3</td>
<td>Contaminant Transport and Distribution</td>
<td>TBD</td>
<td>• HW#3 Retardation Equation</td>
<td>20</td>
<td>September 28</td>
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<td>• HW#4 Moment Analysis</td>
<td>20</td>
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<td>4</td>
<td>Site Characterization</td>
<td>TBD</td>
<td>• Case Study: Site Characterization</td>
<td>20</td>
<td>October 12</td>
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<td>• EXAM 1</td>
<td>100</td>
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<td>5</td>
<td>Containment/Control</td>
<td>TBD</td>
<td>• Cost/Benefit Comparison worksheet</td>
<td>30</td>
<td>October 26</td>
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<td></td>
<td>• Case Study Discussion: Containment/Control</td>
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<td>6</td>
<td>Pump-and-Treat Limits of Flushing Enhanced Flushing</td>
<td>TBD</td>
<td>• Cost/Benefit Comparison worksheet</td>
<td>30</td>
<td>November 9</td>
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<td></td>
<td>• Case Study Discussion: Pump-and-Treat and Enhanced Flushing</td>
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<td>7</td>
<td>In-situ Physical and Chemical Treatment</td>
<td>TBD</td>
<td>• Cost/Benefit Comparison worksheet</td>
<td>30</td>
<td>November 19</td>
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<td></td>
<td>• Case Study Discussion: In-situ Physical and Chemical</td>
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<td>• EXAM 2</td>
<td>100</td>
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<td>8</td>
<td>In-situ Biological Monitored Natural Attenuation</td>
<td>TBD</td>
<td>• Cost/Benefit Comparison: In-situ treatment</td>
<td>30</td>
<td>November 30</td>
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<td></td>
<td>• Case Study Discussion: In-situ Biological and MNA</td>
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<td></td>
<td>Group Project Work</td>
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<td>• FINALIZED GROUP PROJECT DUE</td>
<td>250</td>
<td>December 5</td>
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<td></td>
<td>• Constructive Critique of other groups</td>
<td>50</td>
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<td>• FINAL EXAM</td>
<td>200</td>
<td>December 12</td>
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<td>8:00–10:30am</td>
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**J. COURSE POLICIES**

Please demonstrate respect and responsibility as a part of this learning community. You are expected to exhibit an attitude of respect and responsibility as follows:

- Submit assignments on time.
- Work to get to know other classmates.
- Reach out through email, Discussions, and Social Media to support each other. If you have good suggestions or resource ideas, please share them with the instructor and peers.
- Respect and be sensitive toward other classmates by choosing your words carefully.
- Add your opinions to participate in the discussions.
- Check the assignments every week.
- Do not get behind.
- Keep up with assignments and grades. Grades will be available in Blackboard: check them regularly to make sure you are current with assignments.
- You are expected to demonstrate maturity and self-direction and to manage your own affairs.
- Do not plagiarize another person’s material. Instances of plagiarism are a serious matter: they will be handled in accordance with Texas A&M University-Corpus Christi policies.

**K. COLLEGE AND UNIVERSITY POLICIES**

**a. 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 on an assignment or test will result in a failing grade.

**b. 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. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

**c. 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 of 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, age, or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

d. **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.

e. **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://www.tamucc.edu/students/GradeAppeal.html](http://www.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 of school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

f. **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, websites, 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. **ACADEMIC SUPPORT**
   a. **Help with Blackboard, Technical Issues, and Learning Online**
      - URL: [http://iol.tamucc.edu](http://iol.tamucc.edu)
Students

“Help” At the bottom of the course menu on the left-hand column of the course interface.

Phone: Help Desk (361) 825-2692

If you are having difficulties accessing course materials from your home computer, first let your instructor know, then contact the IOL Helpdesk at (361) 825-2692 or submit a request via email to IThelp@tamucc.edu.

Technology requirements:

- To prepare your computer for using Blackboard 9.1, go to https://iol.tamucc.edu/techreq.html.
- To view flash (.flv) files from sites such as You Tube, download the Flash player at http://get.adobe.com/flashplayer/.

b. 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/

c. Library Resources

(Including print, electronic, and human) can be accessed through the Mary and Jeff Bell Library website that supports electronic searches of articles, books, journals, course reserves, and databases. It includes information such as Ask a Librarian, research tools, remote access information and tutorials, information about plagiarism and copyright, and interlibrary loan (http://rattler.tamucc.edu/distlearn/). The library is a member of TexShare which provides you with a card that allows you to checkout materials from libraries across Texas. Librarians’ contact information is also on the website and you are encouraged to contact librarians for assistance.

d. Academic Advising

The College of Science and 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 and appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361)825-3928.

M. 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.

N. BLACKBOARD LEARNING SYSTEMS
Blackboard Learning System Help URL: http://iol.tamucc.edu; Phone: (361) 825-2692