BEE468/568
Bioremediation Engineering
3 credits, winter term 2014
T 1400-1550 GILM 234; R 1400-1450 HOV 100

Instructor: Dr. Hong Liu  228 Gilmore Hall
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Phone: 541-7376309
Office hour: R 1500-1600

Description: Fundamental and engineering aspects of using microorganisms, fungi, and plants for the remediation of contaminated soil, groundwater and surface water

Prerequisites: MTH 251; a student must be a pro-school engineering student or graduate student.

Course content and schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Topics</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Jan 7 Introduction; contaminants</td>
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<td>Jan 9 Managing a bioremediation project; fundamentals of physicochemical processes</td>
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<td>Week 2</td>
<td>Jan 14 Fundamentals of physicochemical processes; fundamentals of microbial processes</td>
<td>Case study project assignment</td>
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<td>Jan 16 Biodegradation of contaminants</td>
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<td>Week 3</td>
<td>Jan 21 Biodegradation of contaminants; Site characterization</td>
<td>Reading assignment-1</td>
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<td>Jan 23 Microbial based remediation systems</td>
<td>Pop quiz;</td>
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<td>Week 4</td>
<td>Jan 28 Microbial based remediation systems</td>
<td>Reading quiz-1; Lab project assignment; HW-1 assignment</td>
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<td>Jan 30 Microbial based remediation systems</td>
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<td>Week 5</td>
<td>Feb 4 lab</td>
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<td>Feb 6 Midterm exam</td>
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<td>Week 6</td>
<td>Feb 11 Microbial based remediation systems; mycoremediation</td>
<td>Reading assignment-2</td>
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<td>Feb 13 Fundamentals of phytoremediation</td>
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<td>Week 7</td>
<td>Feb 18 Fundamentals of phytoremediation; phytoremediation systems</td>
<td>HW-1 due;</td>
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<td>Feb 20 phytoremediation systems</td>
<td>HW-2 assignment</td>
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<td>Week 8</td>
<td>Feb 25 Phytoremediation systems</td>
<td>Reading quiz-2</td>
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<td>Feb 27 Phytoremediation systems</td>
<td>Case study project report due</td>
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<td>Week 9</td>
<td>Mar 4 Case study project presentation</td>
<td>HW-2 due</td>
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<td>Mar 6 Treatability study</td>
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<td>Week 10</td>
<td>Mar 11 Lab project presentation</td>
<td>Lab project report due</td>
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<td>Mar 13 Final exam</td>
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*Lecture organization is subject to change. A detailed, and occasionally updated schedule will be maintained on Blackboard.*
Student Learning Outcomes and Course Learning Objectives (CLO):

- Knowledge of Contemporary Issues.
  - CLO 1: Increase knowledge and understanding of contemporary bioremediation technologies (case study project, reading quiz)
  - CLO 2: Conduct a lab project using contemporary bioremediation processes (lab project)

- Ability to Identify, Formulate & Solve Engineering Problems.
  - CLO 1: Demonstrate basic knowledge of terms and concepts (pop quiz, midterm exam, final exam)
  - CLO 2: Use knowledge of biological processes to identify conditions and requirements for bioremediation of contaminants (homework, lab project)

- Ability to Design System Component or Process to Meet Desired Needs.
  - CLO 1: Determine the basic design parameters (pressure, duration etc) for microbial-based remediation approaches (Homework, lab project, final exam)
  - CLO 2: Determine the basic design parameters (size, type of plants) for phytoremediation (homework, final exam)

Textbook:

Optional = Remediation Technologies for Soils and Groundwater. A. Bhandari etc (Eds), ASCE, New York, 2007

Evaluation of Student Performance:

Final grade = Homework (10%) + quiz (10%) + case study project (10%) + lab project (15%) + Midterm Exam (25%) + Final Exam (30%)

Format of quiz and exam questions:

Quiz: short answer questions
Midterm exam: short answer questions
Final exams: short answer questions + long answer questions (quantitative)

Assignments are due by 5:00pm Pacific Standard Time on the due date. Late assignments will be docked 5% for each day that the assignment is past due.

Disruptive Behavior

While the University is a place where the free exchange of ideas and concepts allows for debate and disagreement, all classroom behavior and discourse should reflect the values of respect and civility. Behaviors which are disruptive to the learning environment will not be tolerated. As your instructors, we are dedicated to establishing a learning environment that promotes diversity of race, culture, gender, sexual orientation, and physical disability. Anyone noticing discriminatory
behavior in this class, or feeling discriminated against should bring it to the attention of the
instructors or other University personnel as appropriate.

The following specific behavior is not allowed:

- No cell phones or pagers in class.
- No use of Laptops or other electronic devices for activity outside of its use in THIS
class (i.e, surf the web, email, pictures)
- No reading the Barometer during class
- No eating during class

**Students with Disabilities:**
Accommodations are collaborative efforts between students, faculty and Services for Students
with Disabilities (SSD). Students with accommodations approved through SSD are responsible for
contacting the faculty member in charge of the course prior to or during the first week of the term
to discuss accommodations. Students who believe they are eligible for accommodations but who
have not yet obtained approval through SSD should contact SSD immediately at 737-4098.

**Expectations for Student Conduct**
Student conduct is governed by the university’s policies, as explained in the Office of Student
Conduct: Information and Regulations.

**Academic Integrity**
Students are expected to comply with all regulations pertaining to academic honesty. For further
information, visit Avoiding Academic Dishonesty, or contact the office of Student Conduct and
Mediation at 541-737-3656.

OAR 576-015-0020 (2) Academic or Scholarly Dishonesty:

a) Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to
claim credit for the work or effort of another person, or uses unauthorized materials or fabricated
information in any academic work or research, either through the Student's own efforts or the
efforts of another.

b) It includes:

(i) CHEATING - use or attempted use of unauthorized materials, information or study aids, or an
act of deceit by which a Student attempts to misrepresent mastery of academic effort or
information. This includes but is not limited to unauthorized copying or collaboration on a test or
assignment, using prohibited materials and texts, any misuse of an electronic device, or using any
deceptive means to gain academic credit.

(ii) FABRICATION - falsification or invention of any information including but not limited to
falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.

(iii) ASSISTING - helping another commit an act of academic dishonesty. This includes but is not
limited to paying or bribing someone to acquire a test or assignment, changing someone's grades
or academic records, taking a test/doing an assignment for someone else by any means, including
misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part
or all of an educational assignment to another person (ORS 165.114).
(iv) TAMPERING - altering or interfering with evaluation instruments or documents.

(v) PLAGIARISM - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.

c) Academic Dishonesty cases are handled initially by the academic units, following the process outlined in the University's Academic Dishonesty Report Form, and will also be referred to SCCS for action under these rules.

**OSU Student Evaluation of Teaching**
Course evaluation results are extremely important and are used to help me improve this course and the learning experience of future students. Results from the 19 multiple choice questions are tabulated anonymously and go directly to instructors and department heads. Student comments on the open-ended questions are compiled and confidentially forwarded to each instructor, per OSU procedures. The online Student Evaluation of Teaching form will be available toward the end of each term, and you will be sent instructions via ONID by the Office of Academic Programs, Assessment, and Accreditation. You will log in to “Student Online Services” to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted.