**Course Name:** Bioremediation Engineering

**Course Number:** BEE 468/568

**Credits:** 4

**Instructor name:** Professor Hong Liu

**Instructor email:** hong.liu@oregonstate.edu

# Course Description

This course is designed to explain fundamental and engineering aspects of using microorganisms, plants, and fungi for the remediation of contaminated soil and water. Students will complete homework and discussion assignments aimed at critical thinking about basic principles and processes in bioremediation. Quizzes and a midterm exam will be used to assess their understanding of the course material. Students will acquire practical knowledge through researching for information, creating a proposal, and conducting a group project to solve common real-world problems.

# Communication

Please post all course-related questions in the Q&A Discussion Forum so that the whole class may benefit from our conversation. Please contact me privately for matters of a personal nature. I will reply to course-related questions within 24 hours. I will strive to return your assignments and grades for course activities to you within five days of the due date.

# Course Credits

This course combines approximately 80 hours of instruction, online activities, and assignments for 4 credits.

# Technical Assistance

If you experience any errors or problems while in your online course, contact 24-7 Canvas Support through the Help link within Canvas.  If you experience computer difficulties, need help downloading a browser or plug-in, or need assistance logging into a course, contact the IS Service Desk for assistance. You can call (541) 737-8787 or visit the [IS Service Desk](https://oregonstate.teamdynamix.com/TDClient/Requests/TicketRequests/NewForm?ID=Dr9c0T7BaSI_) online.

# Learning Resources

There is no required textbook for this class. Instead, weekly readings from organizational or government reports, peer-reviewed journals, and books will be made available on Canvas. Fundamental concepts covered by the readings may not be included in lectures, but will be tested on quizzes and exam.

**Note to prospective students**: Please check with the OSU Beaver Store for up-to-date information for the term you enroll ([OSU Beaver Store website](http://osubeaverstore.com/Academics) or 800-595-0357). If you purchase course materials from other sources, be very careful to obtain the correct ISBN.

# Measurable Student Learning Outcomes

**Undergraduate**

Ability to apply knowledge and engineering design to produce solutions that meet desired needs with consideration of public health and safety as well as environmental and economic factors.

* Use knowledge of microbial, plant, and fungal physiology to identify conditions and requirements for bioremediation of contaminants.
* Determine the basic design parameters for microbial bioremediation and phytoremediation.
* Demonstrate an understanding of environmental constraints and resource limitations on the selection of bioremediation approaches

**Graduate**

The undergraduate Student Learning Outcome and the ability to lead the online discussion and the group project and complete a comprehensive soil remediation proposal.

# Evaluation of Student Performance

There are five groups of graded assignments: the phytoremediation project, the soil remediation proposal (graduate students only), homeworks, online quizzes, discussion boards, and the midterm exam.

Grades and overall evaluation of student performance will be based on course activities in the following proportions:

## BEE 468

Phytoremediation Project – 30%

Microbial Bioremediation Homework – 25%

Discussion board –20%

Quizzes – 10%

Midterm Exam – 15%

## BEE 568

Phytoremediation Project – 25%

Soil Remediation Proposal – 10%

Microbial Bioremediation Homework – 20%

Discussion board –20%

Quizzes – 10%

Midterm Exam – 15%

## Letter Grade

| **Grade** | **Percent Range** |
| --- | --- |
| A | 94-100 |
| A- | 90-93 |
| B+ | 87-89 |
| B | 83-86 |
| B- | 80-82 |
| C+ | 77-79 |
| C | 73-76 |
| C- | 70-72 |
| D+ | 67-69 |
| D | 63-66 |
| D- | 60-62 |
| F | 0-59 |

# Course Content

| **Week** | **Topic** | **Learning activities** |
| --- | --- | --- |
| 1 | Course overview; Introduction to bioremediation and microbial processes | Online lectures, readings, videosOnline disuccsionOnline practice quiz |
| 2 | Microbial metabolism of hydrocarbons  | Online lectures, readings, videosOnline disuccsionWeek 2 Quiz Week 2 HW  |
| 3 | In-situ microbial remediation techniques | Online lectures, readings, videosOnline disuccsionWeek 3 HW |
| 4 | Ex-situ microbial remediation techniques | Online readings, videosOnline disuccsionWeek 4 HW. |
| 5 | Midterm exam | Midterm examOnline discussion |
| 6 | Phytoremediation fundamentals | Online lectures, readings, videosOnline disuccsionOnline practice quiz Phytoremediation project: individual draft design  |
| 7 | Phytoremediation applications: riparian buffer and ET cover | Online lectures, readings, videosOnline disuccsionWeek 7 Quiz Week 7 HW |
| 8 | Phytoremediation application: wetland | Online lectures, readings, videosWeek 8 Quiz Week 8 HWPhytoremediation project: individual draft design |
| 9 | Mycoremediation fundermentals | Online lectures, readings, videosOnline disuccsionPhytoremediation project:Reivew |
| 10 | Mycoremediation techniques | Online readings, videosOnline disuccsionWeek 10 Quiz Phytoremediation project: final project report; team participation statement |

# Course Policies

## Discussion Participation

Students are expected to participate in all graded discussions. While there is great flexibility in online courses, this is not a self-paced course. Your first post is due on Friday, and your second post due on Mondy of the following week.

## Late Work Policy

Assignments are due by 11:59pm Pacific Standard Time on the due date. Late assignments will be **docked 5%** for each day that the assignment is past due.

## Makeup Exams

Makeup exams will be given only for missed exams excused in advance by the instructor. Excused absences will not be given for airline reservations, routine illness (colds, flu, stomach aches), or other common ailments. Excused absences will generally not be given after the absence has occurred, except under very unusual circumstances.

## Incompletes

Incomplete (I) grades will be granted only in emergency cases (usually only for a death in the family, major illness or injury, or birth of your child), and if the student has turned in 80% of the points possible (in other words, usually everything but the final paper). If you are having any difficulty that might prevent you completing the coursework, please don’t wait until the end of the term; let me know right away.

## Statement Regarding Religious Accommodation

Oregon State University is required to provide reasonable accommodations for employee and student sincerely held religious beliefs.  It is incumbent on the student making the request to make the faculty member aware of the request as soon as possible prior to the need for the accommodation. See the [Religious Accommodation Process for Students](http://eoa.oregonstate.edu/religious-accommodation-policy).

## Guidelines for a Productive and Effective Online Classroom

Students are expected to conduct themselves in the course (e.g., on discussion boards, email) in compliance with the university’s regulations regarding civility. Civility is an essential ingredient for academic discourse. All communications for this course should be conducted constructively, civilly, and respectfully. Differences in beliefs, opinions, and approaches are to be expected. In all you say and do for this course, be professional. Please bring any communications you believe to be in violation of this class policy to the attention of your instructor.

Active interaction with peers and your instructor is essential to success in this online course, paying particular attention to the following:

* Unless indicated otherwise, please complete the readings and view other instructional materials for each week before participating in the discussion board.
* Read your posts carefully before submitting them.
* Be respectful of others and their opinions, valuing diversity in backgrounds, abilities, and experiences.
* Challenging the ideas held by others is an integral aspect of critical thinking and the academic process. Please word your responses carefully, and recognize that others are expected to challenge your ideas. A positive atmosphere of healthy debate is encouraged.

## Expectations for Student Conduct

Student conduct is governed by the university’s policies, as explained in the [Student Conduct Code](http://studentlife.oregonstate.edu/code). Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

## Academic Integrity

Students are expected to comply with all regulations pertaining to academic honesty. For further information, visit [Student Conduct and Community Standards](http://studentlife.oregonstate.edu/studentconduct), or contact the office of Student Conduct and Mediation at 541-737-3656.

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

1. 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.
2. It includes:
	1. 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.
	2. FABRICATION - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.
	3. 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).
	4. TAMPERING - altering or interfering with evaluation instruments or documents.
	5. 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.
3. 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.

## TurnItIn

Your instructor may ask you to submit one or more of your writings to Turnitin, a plagiarism prevention service. Your assignment content will be checked for potential plagiarism against Internet sources, academic journal articles, and the papers of other OSU students, for common or borrowed content. Turnitin generates a report that highlights any potentially unoriginal text in your paper. The report may be submitted directly to your instructor or your instructor may elect to have you submit initial drafts through Turnitin, and you will receive the report allowing you the opportunity to make adjustments and ensure that all source material has been properly cited. Papers you submit through Turnitin for this or any class will be added to the OSU Turnitin database and may be checked against other OSU paper submissions. You will retain all rights to your written work. For further information, visit [Academic Integrity for Students: Turnitin – What is it?](http://guides.library.oregonstate.edu/c.php?g=286121&p=1906660)

# Statement Regarding Students with Disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval, please contact DAS immediately at 541-737-4098 or at <http://ds.oregonstate.edu>. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

# Accessibility of Course Materials

All materials used in this course are accessible. If you require accommodations please contact [Disability Access Services (DAS)](http://ds.oregonstate.edu/home/).

Additionally, Canvas, the learning management system through which this course is offered, provides a[vendor statement](https://www.canvaslms.com/accessibility)certifying how the platform is accessible to students with disabilities.

# Tutoring and Writing Assistance

[NetTutor](http://ecampus.oregonstate.edu/services/student-services/online-tutoring/) is a leading provider of online tutoring and learner support services fully staffed by experienced, trained and monitored tutors. Students connect to live tutors from any computer that has Internet access. NetTutor provides a virtual whiteboard that allows tutors and students to work on problems in a real time environment. They also have an online writing suite where tutors critique and return essays within 24 to 48 hours. Access NetTutor from within your Canvas class by clicking on the Tools button in your course menu.

The Oregon State [Online Writing Suite](http://writingcenter.oregonstate.edu/online-writing-lab) is also available for students enrolled in Ecampus courses.

# Ecampus Reach Out for Success

University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it’s important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about [resources that assist with wellness and academic success](https://counseling.oregonstate.edu/reach-out-success).

Ecampus students are always encouraged to discuss issues that impact your academic success with the [Ecampus Success Team](https://ecampus.oregonstate.edu/services/student-services/). Email ecampus.success@oregonstate.edu to identify strategies and resources that can support you in your educational goals.

## For mental health:

Learn about [counseling and psychological resources for Ecampus students](https://counseling.oregonstate.edu/main/ecampus-students). If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

## For financial hardship:

Any student whose academic performance is impacted due to financial stress or the inability to afford groceries, housing, and other necessities for any reason is urged to contact the Director of Care for support (studentassistance@oregonstate.edu or 541-737-8748).

# Student Evaluation of Courses

During Fall, Winter, and Spring term The online Student Evaluation of Teaching system opens to students the Wednesday of week 8 and closes the Sunday before Finals Week. Students receive notification, instructions and the link through their ONID. They may also log into the system via Online Services. Course evaluation results are extremely important and used to help improve courses and the hybrid learning experience for future students. Responses are anonymous (unless a student chooses to “sign” their comments, agreeing to relinquish anonymity) and unavailable to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor.  Anonymous (unsigned) comments go to the instructor only.