BEE 221 – Fundamentals of Ecological Engineering

Course Schedule & Syllabus – Winter 2021

Instructor: Dr. Gerrad Jones, 240 Gilmore Hall, 541-737-4534, gerrad.jones@oregonstate.edu

Office Hours: M, F:12-1 pm. If these times do not work, please make an appointment. I will ***try*** to post 20-minute introductory lectures a day before class. This will free up 20 minutes of time at the beginning/end of class for questions.

Office hour expectations: Interacting with students is my favorite part of working at OSU. Nevertheless, working with students is also the most time consuming. Therefore, I ask you to come to office hours well prepared with well thought out questions and a demonstration of what you have attempted so far. Office hours are not a place for you to formulate ideas or develop questions. Please be respectful of your time as well as mine.

Textbook: Most real-world answers are not found in a textbook but require individuals to synthesize information from multiple sources. Therefore, I do not use a textbook. Instead, I will provide relevant material on Canvas and will use online materials (e.g., Khan Academy) to supplement lectures to provide more detail on topics. Most assignments will require students to find relevant information on their own, which encourages self-directed learning and independent thought. The ability to find information is a skill I try to foster in this class.

Course description from catalog: Introduction to the concepts and practice of ecological engineering including characteristics, classification, and modeling of ecosystems; ecosystem protection; and sustainable uses of ecosystems, including treatment wetlands, land treatment systems, and ecologically sensitive stormwater management, to meet the needs of human societies.

Course Schedule

Week	Date	Topic	Assignments
1	1	Syllabus; ethics; redox chemistry	Quiz 1
	2	Thermodynamics	Homework 1
2	3	Environmental conditions	Homework 2
	4	Carbonate chemistry	
3	5	N and P cycling	Homework 3
	6	Mass extinctions (aka, C and S cycling)	
4	7	Chemical kinetics part 1	Homework 4
	8	Chemical kinetics part 2	Quiz 2
5	9	Mass balances; batch reactors	Homework 5
	10	Mass balances; PFR and CSTR reactors	
6	11	Engineering Security and Resiliency	Midterm
	12		Homework 6
7	13	Physicochemical treatment processes	
	14		Homework 7
8	15	Wastewater treatment processes	
	16	Decentralized wastewater treatment	Homework 8
9	17	Agriculture	
	18	WWTP Tour???	
10	19	Final presentations	Presentations
	20	Final presentations	
	Finals	Final report (Due Monday 8am)	Final Report

Please see the course schedule on Canvas for up-to-date details on class activities and responsibilities each week.

Instructional objectives and student learning outcomes of the course (ABET outcomes are indicated):

Following completion of this course, students should be able to:

- Apply fundamental tools (mass balances, chemical stoichiometry, redox chemistry) to solve ecological engineering problems.
- Use logic to justify assumptions when straightforward answers are not available.
- Develop your chemical intuition to predict an engineering/chemical outcome.
- Design ecological alternatives to existing/traditional engineering technologies.
- Demonstrate familiarity with the engineering code of ethics (ABET).
- Recognize personal and workplace bias (ABET).
- Identify ethical factors that affect engineering design (ABET).
- Develop a strategic plan to accomplish a goal and evaluate your performance (ABET).
- Engage in self-directed learning (ABET)
- Find relevant information from literature and apply it to engineering design (ABET)

Teaching Philosophy

Throughout my academic career, I experienced the greatest growth when encouraged to perform at a top-tier level. As a young student, I quickly realized that success is not achieved solely through inherent intelligence, but is instead earned through hard work and persistence. When pushed to achieve high standards, students adapt to challenging learning environments, which builds confidence and results in increased academic performance. Therefore, I advocate pushing students beyond their current abilities in order to help them unlock unrealized potential. I believe this can be achieved with thought-provoking assignments that have real-world applications. In my experience, these types of assignments are valuable as they require creativity and allow students to take ownership of their work.

While expectations of students should be high, they must be accompanied by an unparalleled level of commitment to high-quality education from faculty. At all levels of my academic career, the best professors were actively engaged and invested in the growth of their students. I believe this commitment not only includes thorough preparation of course materials (including designing challenging assignments/tests, preparing stimulating lectures, and providing relevant examples illustrating the importance of lecture topics), but also maintaining a positive and enthusiastic attitude both in- and outside of the classroom. Furthermore, I know that questions do not only arise in the classroom and believe that faculty should be prepared to help students by having reasonable office hours and an open door policy. This is especially true for minority students and students of disadvantaged socio-economic backgrounds who often have many barriers that prevent them from succeeding. As a low-income minority student (¼ Native American, ¼ African American), I faced many of these challenges (e.g., racism, financial/food insecurity, lack of academic opportunities). I would therefore like to use my experiences to help all students including minorities to achieve their academic goals. I believe this dedication to teaching and commitment to students applies equally to entry level and advanced courses.

Assessments and Grading

My aim is not to evaluate your ability to perform well on an assignment, but to encourage student growth and development. Because all students have different strengths and weaknesses, I will use a variety of tools to assess student performance. Every assignment will have a rubric, and each problem will be graded using the following scale:

Exceeds expectations (100% of points awarded): Students demonstrate mastery of a topic. This could include performing a calculation correctly or using strong reasoning and logic to justify/complete a problem.

Meets expectations (75% of points awarded): Students demonstrate knowledge and effort on a topic but have not yet achieved mastery. Some errors in calculations and/or reasoning are present.

Below expectations (50% of points awarded): Students fail to demonstrate knowledge in topic. Students invest minimal effort into learning the material. Gaping holes in reasoning or logic are present.

Simply by submitting an assignment, students will get 50% of points. Because 50% of the points are awarded for effort, I do not curve final grades. Blank answers will receive 0 points.

Disclaimer: I understand that a grade can be a poor indication of a student's abilities or what has been learned. In most cases, an investment and commitment to learning is more important than getting the right answer. During my first semester as an undergraduate, I took differential calculus. I struggled for various reasons, and based on points, I should have received a D-. My professor gave me a B- in the course, and I can only assume it was because I attended office hours at least 3 days a week for 15 weeks, thus demonstrating my commitment to learning. Commitment to learning is not something that can be measured, but I reserve the right to give students the benefit of the doubt when it comes to their final grades, especially when they have demonstrated a strong commitment to learning. It is up to the student to demonstrate this commitment, whatever form it may take.

Quizzes/homework: These assignments are generally straightforward and meant to give students an opportunity to practice concepts discussed in class. They are also intended to provide me with immediate feedback on student comprehension of covered material. They will be used to evaluate course and ABET learning outcomes. You are encouraged to talk to and work with classmates outside of class. You are also encouraged to contact me when you have questions, but all work must be your own. **Never copy or otherwise plagiarize someone else's work.** Solution keys will be provided for each homework assignment.

Midterm: There will be one midterm that will cover all material from the first half of the course.

Final: The final grade will consist of a final presentation and project. The final will challenge students to apply all skills gained throughout the course to a hypothetical engineering design project. The final includes a 10-minute presentation and a final report. No page limit is required for the report, but I expect it to be polished and well written. The good report is always succinct and precise. Say exactly what you mean to say in as few words as possible.

Grading: Quizzes/homework (30%), midterm (20%), presentation (15%), final report (25%)

I use a standard academic grading system for the United States:

A: 93-100%, **A-**: **90-93%, B+**: 87-90%, **B**: 83-87%, **B-**: 80-83%, **C+**: 77-80%, **C**: 73-77%, **C-**: 70-73%, **D+**: 67-70%, **D**: 63-67%, **D-**: 60-63%, **F**: < 60%

Absences: I do not take attendance, and all assignments will be turned in on Canvas. Late assignments will not be accepted, but I will drop the lowest homework assignment to be accommodating to life's situations.

Statement Regarding Cell Phones, Similar Devices, and Laptop Computers

While class is in session, cell phones and similar devices are not to be used for texting or for any other non-class-related purpose. You are expected to focus on lectures and other class activities and not allow yourself to be distracted by your cell phone. Laptop computers, when used in class, are to be used only for class-related activities. Some activities will require laptops and Excel, and some course materials in an electronic format. It is acceptable for you to use your laptop computer in class for these purposes and to access those materials. Also, if you desire to do so, you may take notes on your laptop computer. However, the use of laptops for non-class-related activities is not permitted.

Statement Regarding Basic Needs

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live, and believes this may affect their performance in the course, is urged to contact the Human Services Resource Center (HSRC) for support (hsrc@oregonstate.edu, 541-737-3747). The HSRC has a food pantry (https://studentlife.oregonstate.edu/hsrc/food-security/hsrc-food-pantry), a textbook lending program (https://studentlife.oregonstate.edu/hsrc/textbooks) and other resources to help. Furthermore, please notify the instructor if you are comfortable in doing so.

University and Departmental Policies

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.

Student Conduct: Students are expected to be honest and ethical in their academic work and to avoid academic misconduct. Academic Misconduct is defined as, "Any action that misrepresents a student or group's work, knowledge, or achievement, provides a potential or actual inequitable advantage, or compromises the integrity of the educational process." Prohibited behaviors include, but are not limited to, doing or attempting the following actions: cheating; plagiarism; falsification; assisting; tampering; multiple submissions of work; and unauthorized recording and use, all as defined in the Code of Student Conduct. Misconduct by students is subject to the disciplinary process described in the Code of Student Conduct and may include several possible penalties up to and including expulsion from OSU. Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct and Community Standards for disciplinary action.

"The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student's freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office."

ABET Assignments for BEE 221, Winter 2021

PLO #4: Ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

- CLO1: Demonstrate familiarity with the engineering code of ethics.
    1. Code of ethics quiz (quiz 1)
    2. Code of ethics writing assignment (homework 1)
    3. Self assessment
- CLO2: Recognize personal and workplace bias.
    1. Take the Harvard implicit bias test and report on your personal bias
    2. Identify ways for students and faculty to address bias in the workplace (homework 4)
    3. Self assessment
- CLO3: Identify ethical, social, and/or legal factors that influence engineering designs.
    1. Identify factors in a design that increase resiliency (final presentation)
    2. Research state laws to determine if your design violates Oregon codes (final report)
    3. Self assessment

PLO #7: Ability to acquire and apply new knowledge as needed, using appropriate learning strategies

- CLO4: Develop a strategic plan to accomplish a goal and evaluate your performance.
    1. Water use survey
    2. Evaluate your group performance on completing your resilience project
    3. Self assessment
- CLO5: Engage in self-directed learning to learn new engineering topics
    1. Code of ethics writing assignment (homework 1)
    2. Identify ways for students and faculty to address bias in the workplace (homework 4)
    3. Self assessment
- CLO6: Find relevant information from relevant literature and apply it to ecological engineering designs.
    1. Water treatment (final report)
    2. Composting manure (final report)
    3. Self assessment