BEE 221 – Fundamentals of Ecological Engineering

Course Schedule & Syllabus – Winter 2018

Instructor: Roger Ely, 201 Gilmore Hall, 7-9409, ely@engr.orst.edu
Office Hours: TBA or Email Prof. Ely for appointment.

Course Description: 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.

Prerequisites: One year of college biology and chemistry and MTH 256 or instructor approval required.

Course Content and Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Tuesdays 10:00-11:20</th>
<th>Thursdays 10:00-11:20</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 9 Introduction/Overview/App</td>
<td>Jan 11 Mass Balances; Reactor Kinetics (M1, pp 5-13)</td>
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<td>2</td>
<td>Jan 16 Environmental Chemistry (M3, pp 1-9)</td>
<td>Jan 18 Environmental Chemistry (M3, pp 10-14)</td>
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<td>3</td>
<td>Jan 23 The Carbonate System; Volatilization (M3, pp 10-14)</td>
<td>Jan 25 Water Demand; Water Pollutants (M4, pp 1-9)</td>
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<td>4</td>
<td>Jan 30 Oxygen Demand; BOD Test (M4, pp 10-13)</td>
<td>Feb 1 Modeling BOD (M4, pp 14-16)</td>
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<td>5</td>
<td>Feb 6 Midterm Exam #1 – Mass Balances &amp; Environmental Chemistry</td>
<td>Feb 8 Effects of Oxygen Demand in Rivers (M5, pp 1-5)</td>
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<td>6</td>
<td>Feb 13 Modeling Oxygen Demand in Rivers (M5, pp 6-7)</td>
<td>Feb 15 Water Quality in Lakes; Groundwater; Darcy’s Law (M5, pp 8-14)</td>
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<td>7</td>
<td>Feb 20 Conventional Water Treatment Processes; Sedimentation (M6, pp 1-8)</td>
<td>Feb 22 Conventional Wastewater Treatment Processes; Biological Processes (M7, pp 1-6 to 8)</td>
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<td>8</td>
<td>Feb 27 Midterm Exam #2 – Water Resources &amp; Water Quality</td>
<td>Mar 1 Suspended Growth Biological Processes (M7, pp 6-12)</td>
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<tr>
<td>10</td>
<td>Mar 13 Ecological Concepts &amp; Systems (M9, pp 1-5)</td>
<td>Mar 15 Living Machines (M10, pp 1-4)</td>
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There will be two midterm exams, as shown in the schedule above.

Final Exam: Monday, March 19, 9:30 AM.
**Grading:** In-class exercises and homework - 20%; each midterm exam - 25%; final exam - 30%. The final exam will be comprehensive but will emphasize material not covered in the two midterm exams.

**Statement Regarding Homework:**
Homework is for your benefit. You may talk with classmates about homework questions or may collaborate with each other, but only to seek clarification of questions. You are also encouraged to contact the GTA or the instructor when you have questions. *All work turned in must be your own work.* Never copy or otherwise plagiarize someone else’s work. Unless stated otherwise, homework assignments are due one week after assigned. *Late homework assignments will not be accepted and will receive a grade of zero.*

**Course Specific Measurable Student Learning Outcomes:**

- **Learning Outcome 1:** Use mass balances to solve problems
- **Learning Outcome 2:** Write and balance reaction equations; calculate stoichiometry, solubility of solids and gases, carbonate speciation, and alkalinity.
- **Learning Outcome 3:** Understand hydrologic cycle, human water usage, types of pollutants, oxygen demand and its effects in rivers; water quality in lakes; use BOD calculations and Streeter-Phelps method to determine oxygen sag in rivers; model washout and accumulation of pollutants in lakes
- **Learning Outcome 4:** Understand aquifers and groundwater flow; use Darcy’s Law to model it
- **Learning Outcome 5:** Demonstrate knowledge of current physical and biological processes for treating water and ability to analyze them mathematically
- **Learning Outcome 6:** Understand how ecological engineering approaches for water treatment compare with more commonly used methods; demonstrate ability to estimate size requirements for constructed wetland treatment systems

**Learning Resources:** Notes provided by instructor; lectures; practice problems in class; homework

**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 the instructor may provide you with 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.*

**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](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:** The BEE Department follows the university rules on student conduct, which may be found at:


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.”