Syllabus

BEE 102, Ecological Engineering: Applying Engineering to Ecosystems, Spring 2018

Instructor: Dr. Desiree Tullos
Professor, Biological & Ecological Engineering Department
233 Gilmore Hall
Phone: 737-2038
e-mail: desiree.tullos@oregonstate.edu
Lectures: 2:00-3:20 Tuesday, Thursday
Office Hours: Wednesdays, 2-4pm; 233 Gilmore Hall

Course Description from catalog: The purpose of this course is to introduce students to common problems and solutions in Ecological Engineering, emphasizing the multiplicity of approaches to constraining, analyzing, and resolving challenges of ecosystem management. The objectives of the course are to (1) introduce students to approaches in systems analysis for application within Ecological Engineering and (2) foster critical thinking skills through in-class, homework, and group assignments on real-world problems in Ecological Engineering. Further, students will be required to study an assigned ecological practice, identify and verify resources, and synthesize and critique common solutions in a written and oral presentation formats.

Course Credits (3 Credits): This course will meet three hours per week as lecture.

Prerequisites, Co-requisites and Enforced Prerequisites: NA

Learning Resources: No textbook is required but students will be required to access materials that are made available via Canvas.

Instructional objectives and student learning outcomes of the course. In accordance with ABET’s a-k learning outcomes, students completing this course will possess:

1. Ability to function on multi-disciplinary teams [ABET OUTCOME D]
2. An ability to effectively communicate in writing and speaking [ABET OUTCOME G]
3. Understanding of Professional & Ethical Responsibility [ABET OUTCOME F]

Assignments relevant to these three outcomes will be scanned and shared with ABET evaluators. Additional instructor objectives are for students to:

1. Develop familiarity with applying engineering logic to analysis of complex systems.
2. Gain experience defining, comparing, and making design recommendations for ecological engineering practices using multiple analytical approaches.
3. Apply materials/knowledge from class to a specific problem (term project).
Evaluation of Student Performance

Grades will be assigned according to the following scheme:

1. **Assignments – 30%;** You will have four assignments – Project synthesis oral presentation (group), temperature analysis (individual), LCA analysis (group), ERA analysis (group).

2. **Mid-term exam - 30%.** The midterm will be based on lectures and in class examples, homework assignments, and reading discussions. The exam will require students to interpret graphs discussed in class, discuss and justify engineering alternatives, and apply concepts to unfamiliar problems. Format for the exam will include short answer, calculation, and discussion questions used to test students’ knowledge on vocabulary, concepts, and cause-effect relationships.

3. **Final project 30%.** Appropriateness of motivation, data collection, methods, project analysis of alternatives, design details, justification and defense of assumptions, recommendations. Students will present for approximately 10 minutes on their analysis on the ecological engineering practice. Presentations will be evaluated based on the grading rubric provided. Grade includes evaluation by peers.

4. **Reading quizzes (10%):** Since there is no textbook for Ecological Engineering, the assigned readings are an important part of this class. Reading the papers in advance of class and contributing to discussions is essential. Students will be directly graded via nine quizzes posted on Canvas, which must be submitted before class begins. Students will also see questions from the reading quizzes on the midterm exam.

**Due dates and times:** 10% (one letter grade) will be deducted for every day an assignment is submitted late. Assignments will not be accepted after three days. Deviations from this late policy will not be accepted except under very extenuating circumstances (e.g. death in family) and must be negotiated with the instructor in advance of the deadline.

**Group assignments:** If it is rigorously determined that a student does not contribute to the group assignments, I reserve the right to adjust their grade appropriately.
<table>
<thead>
<tr>
<th>Week</th>
<th>Theme</th>
<th>Reading assignment</th>
<th>Tuesday</th>
<th>Content</th>
<th>Thursday</th>
<th>Content</th>
<th>HW</th>
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<tbody>
<tr>
<td>1</td>
<td>Intro to EcoE</td>
<td>Mitsch 2003</td>
<td>3-Apr</td>
<td>Course introduction - Introductions, expectations, outcomes, and evaluation; Overview of assignments and evaluation rubrics; Overview of Ecological Engineering;</td>
<td>5-Apr</td>
<td>Discuss Mitsch 2003 paper; Engineering Ethics and the PE/PE track</td>
<td>Complete Introductory Surveys, Read Mitsch 2003</td>
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<td>2</td>
<td>Ecosystem processes</td>
<td><a href="http://vimeo.com/8720778">http://vimeo.com/8720778</a>, Schlesinger 2011, Tilley 2004</td>
<td>10-Apr</td>
<td>Ecosystems, ecological cycles, and energy in ecosystems; Team projects assigned; Rules of Engagement</td>
<td>12-Apr</td>
<td>GUEST LECTURER: Linsday Markm. 1) Discussion Board posting: Rules of Engagement; 2) Reading quiz</td>
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<td>3</td>
<td>Systems theory; effective collaborations</td>
<td>Holling (1996) &amp; Turetsky (2010)</td>
<td>17-Apr</td>
<td>The “I in team” activity; Systems theory, resilience, disturbance, causation, and feedbacks; Discuss Holling (1996)</td>
<td>19-Apr</td>
<td>Student presentations on term projects</td>
<td>HW #1: Project overview presentations</td>
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<td>4</td>
<td>Mass and energy; Thermal budgets of wetlands</td>
<td>1) Oregon wetlands factsheet; 2) Kadlec (2008): Energy flows in wetlands (Pages 1-2); 3) Molalla/Pudding TMDL (Pages C2-C4)</td>
<td>24-Apr</td>
<td>1) Intro to mass/energy balances; 2) simple water budget problem; 3) Energy in ecosystems &amp; basic thermodynamics; 4) energy budgets in wetlands;</td>
<td>26-Apr</td>
<td>FIELD TRIP TO TALKING WATER GARDENS</td>
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<td>5</td>
<td>Thermal budgets of wetlands</td>
<td>Costanza (1997)</td>
<td>1-May</td>
<td>1) Continue thermal budgets of wetlands; 2) Define models behind spreadsheet; 3) HW set up and Excel excitation: using temperature credits worksheet (bring laptops); 4) In-class calculations: Sensitivity analysis and thermal budgets of wetlands.</td>
<td>3-May</td>
<td>GUEST LECTURER: Willamette Partnership; review for midterm exam</td>
<td>HW #2: Temperature credits in treatment wetland</td>
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<td>6</td>
<td>LCA</td>
<td>Introduction to LCA with SimaPro (Ch. 2)</td>
<td>8-May</td>
<td>MIDTERM</td>
<td>10-May</td>
<td>Introduction to LCA</td>
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<td>7</td>
<td>LCA</td>
<td>ODEQ bottled water LCA (Executive Summary); RESCON Ch. 2 (pages 3-5)</td>
<td>15-May</td>
<td>GUEST LECTURER (Ganti Murthy): LCA in biofuels</td>
<td>17-May</td>
<td>Discuss reading; Mapping material flows with LCA for term project</td>
<td>HW #3: LCA</td>
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<td>8</td>
<td>Risk and probabilities in ecosystems</td>
<td><a href="https://www.epa.gov/eca/ecological-risk-assessment/Exec-Summary-through-Phase-3">https://www.epa.gov/eca/ecological-risk-assessment/Exec-Summary-through-Phase-3</a></td>
<td>22-May</td>
<td>Intro to ERA</td>
<td>24-May</td>
<td>Mapping risk pathways for term project</td>
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<td>10</td>
<td>Wrap up</td>
<td>Engineering ethics PE/PE</td>
<td>5-Jun</td>
<td>Engineering ethics</td>
<td>7-Jun</td>
<td>Final presentations</td>
<td>Engineering Ethics reading basic</td>
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**REVISION DATE:** 2018.04.10
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.”

Rules on Civility and Honesty: The Biological & Ecological Engineering Department follows the university rules on civility and honesty. These can be found at: http://studentlife.oregonstate.edu/code.

Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct 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.”