BEE 311 Ecological Fluid Mechanics
4 Credit Hours
Fall 2013

Lead Instructor: Chad Higgins
Room: STAG 208
Telephone: 541-737-2286
Email: chad.higgins@oregonstate.edu

Lecture Hours: MWF 4:00-4:50
Section: W 5:00-5:50
Office hours: Open door Gilmore 200

TA: Mark Luterra
Email: luterram@onid.orst.edu

Catalog Description:

BEE 311 Ecological Fluid Mechanics (4 hr) Fluid properties, fluid statics, fluid motion, conservation of mass, momentum and energy for incompressible fluids, dimensional analysis, ecological engineering applications.

Required Text:

Elger Williams Crowe and Robertson, Engineering Fluid Mechanics, 10th Edition

Recommended Reading:

None

References:

None

Measurement:

Students will be assessed through a midterm examination, a final examination and weekly problem sets. Homework assignments will be given on Wednesday each week, due the following Thursday.
Table 1. Grading breakdown for BEE 311.

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<thead>
<tr>
<th>BEE 311</th>
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<tbody>
<tr>
<td></td>
<td>Midterm Exam: 30%</td>
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<td>Final Exam: 40%</td>
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<td>Weekly Problem Sets: 30%</td>
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BEE 311 Learning Objectives:

Goals for the course include:

1. Analysis of fundamental concepts and governing equations for fluid flow applied to biological organisms and ecological systems.
2. Develop conceptualization and analytical skills to conduct analysis of ecological systems.
3. Develop skills to conduct rigorous engineering analysis and present results in a clear and concise manner.

ABET Program Learning Objectives met by BEE 311:

C. *Ability to Design System Component or Process to Meet Desired Needs.*

K. *Ability to Understand Techniques, Skills, and Modern Engineering Tools for Engineering Practice.*

L. *Ability to Apply Knowledge in Specialized Area Related to Ecological Engineering.*

Schedule

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<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Intro, definitions, history and significance</td>
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<td>Fluid properties, units of measure</td>
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<td>Statics I: pressure forces on flat plates</td>
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<td>Week 2</td>
<td>Statics II: forces on curves, buoyancy</td>
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<td>Statics III: Ecological Engineering applications</td>
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<td>Velocity and acceleration, Euler’s equation</td>
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<td>Week 3</td>
<td>Bernoulli’s equation and its application</td>
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<td>rotation and vorticity</td>
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<td>Control volume approach, flow rates and the conservation of mass</td>
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Week 4 | Continuity derivation and applications
| The Momentum equation
| Ecological Applications of the momentum equation

Week 5 | Moment of momentum and the sprinkler
| Energy Principle
| Midterm exam (October 30th 2013)

Week 6 | Combined use of energy, mass and momentum equations
| Concepts of Hydraulic and energy grade lines
| Dimensional analysis and the Buckingham Pi theorem

Week 7 | Common Dimensionless numbers and Similitude
| Ecological Applications of Dimensional analysis
| Surface resistance, shear, and the boundary layer

Week 8 | Applications to the atmospheric boundary layer
| Flow in pipes laminar and turbulent
| Energy losses in pipes

Week 9 | The moody Diagram
| Drag, flow around objects
| Flow through pant canopies

Week 10 | Flow in open channels
| Manning’s equation
| Hydraulic Jumps

Late homework will be accepted for 3 days following the due date, with 10% of total possible points docked for each day late.

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.”

Academic Dishonesty and Student Conduct:

http://oregonstate.edu/admin/stucon/achon.thtm

At Oregon State University academic dishonesty is defined by the Oregon Administrative Rules 576-015-0020.1.a-c as: An intentional 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. Academic dishonesty includes:

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 interest of information. This includes unauthorized copying or collaboration on a test or assignment or using prohibited materials and texts.

FABRICATION – falsification or invention of any information (including falsifying research, inventing or exaggerating data and listing incorrect or fictitious references.

ASSISTING – Helping another commit an act of academic dishonesty. This includes paying or bribing someone to acquire a test or an assignment, changing someone’s grades or academic records, or taking a test/doing an assignment for someone else (or allowing someone to do these things for you). It is a violation of Oregon state law to create and offer to sell part or all of an education assignment to another person (ORS 165.114).

TAMPERING – altering or interfering with evaluation instruments and documents.

PLAGIARISM – representing the word or ideas of another person as one’s own OR presenting someone else’s words, ideas, artistry or data as one’s own. This includes 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, then submitting it as one’s own.