CE443 – Introductory Environmental Fluid Mechanics

Purdue University, Civil Engineering

Spring Semester 2014

General course information

INSTRUCTOR: DR. CARY TROY – I am an assistant professor in the Hydraulics and Hydrology Group in the School of Civil Engineering. My research interests lie in environmental fluid mechanics – the movement of water in lakes, rivers and oceans - especially water waves and density-stratified flows. Most of my research currently focuses on the fluid mechanics and thermodynamics of Lake Michigan.

email: troy@purdue.edu : please take the time to write a coherent email with a salutation, subject "CE443", and actual punctuation, or I will not respond. (not: "hey bff Prof! r u guna post hw5 sols or what???? LOL ME")
office: CIVL1101D (Hydraulics Area)
phone: 494-3844
website: http://web.ics.purdue.edu/~troy/
office hours: Tuesday and Thursday, 1:30-2pm (my office); or by appointment.

LECTURES: MWF 1:30-2:20 pm, CIVL 2108. We will occasionally meet downstairs in the "wet classroom" in the Hydraulics Laboratory on Fridays, to perform experiments.

PRIMARY TEXT: **Fundamentals of Fluid Mechanics**, by Munson, Young, Okiishi, (and Huebsch). (5^{th}, 6^{th}, or 7^{th} Editions – any of these editions are acceptable)

COURSE WEBSITE: Blackboard Learn (https://mycourses.purdue.edu/) Many of the course-related materials will be posted here, and online quizzes will be given from here.

COURSE POLICIES

Grading:
Homework: 20%
Research project: 10%
Exam I: 20%
Exam II: 20%
Exam III (Final exam): 20%
Quizzes: 5%
Participation: 4%
Mini-assignment: 1% (Like show and tell, students will make a mini-experiment/demo and bring it to class)
Bonus: There may be some opportunities for extra credit; these points are added to HW points

COURSE OBJECTIVES

By the end of this course, students will be able to:

- Perform basic calculations on environmental flows using standard approaches, to estimate velocities, pressures, water elevations, resultant forces, and stresses.
- Derive fundamental solutions and relationships for environmental flows using the appropriate forms of the governing equations and boundary conditions.

COURSE LOGISTICS

Grading procedure:
Course grading will follow the +/- system established by the university, with the below numeric grade delineations. If possible, individual exams will be curved.
A+ (96.6-100); A (93.3-96.6); A- (90-93.3)
B+ (86.6-89.9); B (83.3-86.6); B- (80-83.3)
C+ (76.6-79.9); C (73.3-76.6); C- (70-73.3)
D+ (66.6-79.9); D (63.3-66.6); D- (60-63.3) F : <60
Lectures: I expect participation during lectures, in the form of questions, attention, and participation during in-class exercises. Even if it's the world's most boring lecture, you should pretend like it's exciting by nodding vigorously and occasionally fist-pumping and high-fiving. **Lecture attendance and note taking is crucial for this course since much of the course material is not in the text.**

Homework (20%): Homeworks will be assigned approximately once per week (not more), and will usually be due on Fridays. You are encouraged to work and learn with your fellow students; however, each student is responsible for his/her own work and no form of cheating will be tolerated. Solutions to the homeworks will be posted online. All homeworks should be formatted according to any formatting instructions, which often involve typed summaries of your work.

Late policy: Homeworks turned in less than 48 hours following the due date/time will receive 50% of whatever grade they would have received. After that, no credit will be given. No extensions will be given once the due date has passed – if you have extreme circumstances that preclude your HW from arriving on time, you must contact me in advance of the due date.

Quizzes (5%): Most quizzes will be online quizzes, based (1) on material learned in the previous week and (2) on assigned readings for the course (to be covered the following week). They involve short calculations and are in multiple choice format. Occasionally, in-class quizzes will be given.

Exams (20%, 20%, 20%): There will be two during semester exams and one final exam. The details of these exams will be announced prior to the exams.

Participation (4%): You learn by doing. As painful as it may be, the best way to learn is to participate in your own education. I highly encourage participation in the form of questions, answers, working on in-class worksheets, emails, etc. I should know you pretty well by the end of the semester.

Example participation grades:
4/4: Attends nearly every class; frequently asks questions; attends office hours; no texting during class. When asked to perform in-class activities, participates. At the end of the semester, I know you pretty well.
3.5/4: Attends most classes; quiet, but pays attention and performs in-class activities; does not text during class.
2/4: Attends most classes, but does not perform in-class activities;
1/4: Frequently absent, does not perform in-class activities.

Mini-assignment (1%): Frequently, I have ideas for demonstrations and materials that would make the lectures really "come alive". During the semester, I will propose mini-assignments and ask for volunteers. Once you complete a mini-assignment, you have satisfied the requirement. Some mini-assignments may be more difficult than others.

Extra credit: Any earned extra credit points will be added to your homework point total.

Research project (10%): You will chose and complete a research project on a class-related topic of your choice. This project will be due towards the end of the class, and will involve a typed report (less than 10 pages) and brief presentation. As part of this project, you will perform analysis/calculations and/or experiments in addition to a brief literature review and analysis. The due date and formatting instructions for this assignment will be given later in the semester.

Campus Emergencies/Closures

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Information regarding such changes will be conveyed via email.

Draft course schedule (subject to revision):

HOMEWORKS ARE TYPICALLY DUE FRIDAY, IN CLASS
WHEN ASSIGNED, READING QUIZZES ARE TYPICALLY DUE BY MONDAY 1pm, ONLINE

Week 1 (Mon, 1/13): Introduction; fluid properties; hydrostatics, buoyancy
Week 2 (1/20): Hydrostatics, the atmosphere, and surface tension
Week 3 (1/27): Hydrostatics, the atmosphere, and surface tension
Week 4 (2/3): Inviscid flows: rigid body acceleration, flows with free surfaces
Week 5 (2/10): Rotating flows
Week 6 (2/17): Viscous flows
Week 7 (2/24): (Cary gone): Viscous flows
Week 8 (3/3): Boundary layers
Week 9 (3/10): Drag and Lift
Week 10 (3/17): Spring Break
Week 11 (3/24): Jets and plumes
Week 12 (3/31): Jets, plumes, and diffusers
Week 13 (4/7): Water waves
Week 14 (4/14): Water waves
Week 15 (4/21):
Week 16 (4/28, Dead week): Research project completion