CE299 – Introduction to the Engineering of Water – Fall Semester, 2018

Course description

This course is designed to give 1st and 2nd year undergraduate students hands-on exposure to water-related engineering challenges, techniques, and career paths. Students will gain familiarity with the sub-disciplines of hydraulics, hydrology, environmental engineering, and their treatment in the civil engineering undergraduate curriculum as well as in professional practice. Additionally, this course will aid students in making an informed decision on their engineering specialization. The course is structured as a set of eight 2-hour active "laboratories" involving hands-on experiments, discussions, building, computer modeling, and data analysis.

Course outcomes

After taking this course, students will be able to:

- Explain some of the major water engineering challenges faced by society, including causes, confounding factors, and possible solutions
- Describe different career paths related to "water engineering", and make an informed decision regarding the selection of this path at Purdue
- Describe basic water quantity and water quality properties (such as flow rate (discharge), concentration, velocities, loading, stage, etc.)
- Apply basic concepts and equations associated with hydraulics, hydrology, and environmental engineering to natural and engineered water systems

Instructors (alphabetical order) and specializations

- Dr. Antoine Aubeneau (aubeneau@purdue.edu) - transport of substances in rivers, streams, and groundwater.
- Dr. Chip Blatchley (blatch@purdue.edu) - water quality of natural and engineered systems.
- Dr. Rao (G.S.) Govindaraju (govind@purdue.edu) - surface and subsurface hydrology, spatial variability, watersheds.
- Dr. Chad Jafvert (jafvert@ecn.purdue.edu) - water quality of natural and engineered systems.
- Dr. Venkatesh Merwade (vmerwade@purdue.edu) - flood modeling and forecasting; flood plain mapping; flood risk and damage; watershed hydrology.
- Dr. Amisha Shah (adshah@purdue.edu) - physical and chemical processes in water treatment, disinfection by-product formation, and aquatic photochemistry.
- Dr. Cary Troy (troy@purdue.edu) - environmental fluid dynamics, lake physics ("physical limnology"), coastal engineering, oceanography, and Lake Michigan.
- Dr. George Zhou (zhizhou@purdue.edu) - biological wastewater treatment, biofuel, electrochemical membrane filtration.

Course logistics

The course meets on Thursdays, 1:30-3:20, Robert Heine Pharmacy Building 162, for the first eight weeks of the semester. The class will frequently be conducting activities elsewhere on campus, including the Civil Engineering Building (HAMP). **For class periods meeting in HAMP 2146 (Env. Eng. Lab), no shorts or open-toed shoes are allowed, and open-toed shoes should not be worn for any other classes.**

Course credit

This course can be counted as 1 credit hour of technical elective credit towards the B.S. degree in the Lyles School of Civil Engineering.

Course work and evaluation

Course work will fall under three categories:

1.) Course readings (relating to the next week's class) (pre-work)
2.) In-class and out-of-class participation, as directed/assigned
3.) Homework each week (relating to the previous week's class) (post-work)

Assessment

Course assessment will be based on graded assignments (70%), in-class and out-of-class participation (10%), and any quizzes given during the semester (20%).

Preliminary list of topics and activities (subject to revision)

Course period and title	Faculty	Activities	Topics / exposure
1. Class introduction and water engineering overview (8/23)	Prof. Troy	Introductions, lecture, small group discussions	Water quality and quantity: current challenges: local and global issues. Specializations, programs at Purdue, and career paths.
2. Water quantity (8/30)	Prof. Troy	Wabash River "tour" - gaging station, water sampling, ADV lab demo	Streamflow measurements; streamflow data; acoustic velocimetry
3. Water quality (9/06)	Prof. Shah	Water quality analysis of Wabash River and campus (treated water) sample	Surface water quality issues; eutrophication; nutrient loading; harmful algal blooms; water quality issues of treated water
4. Environmental transport and fate (9/13)	Prof. Aubeneau	Dye release at Todd's creek.	Aqueous transport and transformation of materials in the environment.
5. Water distribution systems (9/20)	Prof. Govindaraju	Design, assemble and assess a water distribution system	Learn about energy (head) loss, design by trial and error.
6. Watershed modeling, drainage, and flood forecasting (9/27)	Prof. Merwade	Hydraulic/Hydrologic watershed modeling (computer-based)	Flooding; Flood modeling;
7. Water treatment (10/4)	Prof. Jafvert	Water treatment and chemical oxidation (laboratory)	Water and wastewater treatment; aquatic chemistry
8. Wastewater treatment (10/11)	Prof. Blatchley, Prof. Zhou	Municipal wastewater: characteristics, treatment processes, and opportunities for resource recovery	Wastewater treatment techniques; waste recovery; alternative energy generation

Other course policies

Email: For overall course issues, email Dr. Cary Troy (troy@purdue.edu). For questions pertaining to individual assignments, please email the individual instructor (listed above) responsible for the assignment.

Academic honesty/integrity: We expect that all students will follow the Purdue University standards regulating academic honesty and personal integrity. This includes treating fellow classmates, teaching assistants, and the instructor with respect, as well as recognizing the line between working together and copying work (either from each other or from a solutions manual). Any plagiarized homework solutions will receive zero credit, and will be referred to the university for formal disciplinary action if necessary.

Absences: No unexcused absences are allowed for the course, without an official university-documented condition. Students who miss a class without prior authorization from the instructor will receive zero credit for the course.

Campus emergencies:

- If you are alerted via the campus alert system during class, immediately let the instructor know.
- **If we hear a fire alarm,** we will immediately suspend class, evacuate the building, and proceed outdoors, and away from the building. Do not use the elevator.
- **If we are notified of a Shelter in Place requirement for a tornado warning**, we will suspend class and go to the lowest level of the building we are in.
- **If we are notified of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting** or other use of weapons, we will suspend class and shelter in our classroom, shutting any open doors or windows, locking/securing/guarding the doors, turning off the lights, and remaining quiet until the situation dictates other action (such as fighting or fleeing).
- **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.

Syllabus disclaimer: The information and policies in this syllabus are subject to change; students will be notified of any substantive changes to course policies. Please contact the course instructor if you are unsure about any of the above policies or plans.