Course: CIV-ENV 340 ~ Hydraulics and Hydrology

Instructor	Edwin Y. Saavedra Cifuentes esaavedrac@u.northwestern.edu Tech A225
Grader	Colleen O'Brien colleenoaposbrien2024@u.northwestern.edu
Day/Time	Lecture -> Mo|We|Fr 12:00-12:50pm Discussion/Labs -> Mo 2:00-3:50pm || 4:00-5:50pm
Office hours	By appointment
Book	*Houghtalen, Osman Akan & Hwang*, Fundamentals of Hydraulic Engineering Systems, 5th edition, Pearson, 2017.
Prereq	MECH_ENG 241

Course description:
Civil and environmental engineering applications of fluid mechanics. The course will start with an introduction to water properties, fluids and flow classification. Then, it will touch on flow in pressurized pipes and pipe networks. An introduction to water pump selection will be given, along with pressure and discharge measurement devices. The next section will be about open channel flow concepts and the corresponding calculations. Finally, an introduction to hydrology for hydraulic design will be given.

Course goals:
After taking this course, students will:

A. Make use of numerical and computational tools to solve hydraulics and hydrology problems, while understanding the governing physics concepts behind them.
B. Understand and quantitatively describe pressurized pipe systems, including looped networks and feedbacks with pump installations.
C. Understand open-channel flow concepts, identify their implications in natural ecosystems, and correctly perform the calculations needed for their quantitative description.
D. Understand key topography and probability concepts and apply them to hydrology and water cycle related problems.

The course contributes to the following standard ABET Student Outcomes for engineering programs:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Outline of topics:

- Fundamental properties of water
- Pressurized pipe systems
- Water pumps
- Open channel flow
- Hydrology for hydraulic design

Evaluation:

- Homeworks (45%)
- Class participation (15%)
- Midterm exam (20%)
- Final exam (20%)

Final letter grade assignments for course:

A	A-	B+	B	B-	C+	C	C-	D	F
100-94	93-90	89-87	86-84	83-80	79-74	73-68	67-60	59-50	50-0

Late assignments will not be accepted without prior approval from the professor or teaching assistant.

Weekly schedule

- Week 1: Water flow fundamentals
- Week 2: Pressurized pipe flow
- Week 3: Pipe networks and water pumps
- Week 4: Solving non-linear systems of equations
- Week 5: Open-channel flow: uniform flow
- Week 6: Open-channel flow: gradually varied flow
- Week 7: Channel design
- Week 8: Hydrology – water cycle
- Week 9: Hydrology for hydraulic design
- Week 10: Probability and hydrological risk

Additional Information

Academic Integrity Statement:

Students on this course are required to comply with the policies found in the booklet, "Academic Integrity at Northwestern University: A Basic Guide". All papers and assignments submitted for credit in this course must be **submitted electronically** unless otherwise instructed by the professor. You may work with other class members for the purpose of solving the homework problems. However, you are responsible for generating your own and independently written solutions for grading. Your written work may be tested for plagiarized content. For details regarding academic integrity at Northwestern or to download the guide, visit: www.northwestern.edu/provost/policies/academic-integrity/index.html. Any form of cheating, including improper use of content generated by artificial intelligence, constitutes a violation of Northwestern's academic integrity policy.

Accessibility Statement:

Northwestern University is committed to providing the most accessible learning environment possible for students with disabilities. Should you anticipate or experience disability-related barriers in the academic setting, please contact AccessibleNU to move forward with the university's established accommodation process (email: accessiblenu@northwestern.edu; phone: 847-467-5530). If you already have established accommodation with AccessibleNU, please let me know as soon as possible, preferably within the first two weeks of the term, so we can work together to implement your disability accommodation. Disability information, including academic accommodations, is confidential under the Family Educational Rights and Privacy Act.

Class Teaching Modality:

Class sessions for this course will occur **in person**. Individual students will not be granted permission to attend remotely except as the result of an Americans with Disabilities Act (ADA) accommodation as determined by AccessibleNU. Should public health recommendations prevent in person classes from being held on a given day, the instructor or the university will notify students. Maintaining the health of the community is our priority. **If you are experiencing any symptoms of COVID do not attend class.** If you experience any symptoms, contact the instructor as soon as possible to arrange to complete coursework. Students who experience a personal emergency should also contact the instructor as soon as possible to arrange to complete coursework.

Class Recordings:

Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy and state law. Students requesting the use of assistive technology as an accommodation should contact AccessibleNU. Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University's Copyright Policy, faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as syllabi, lectures and lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.

Support for Wellness and Mental Health:

Northwestern University is committed to supporting the wellness of our students. Student Affairs has multiple resources to support student wellness and mental health. If you are feeling distressed or overwhelmed, please reach out for help. Students can access confidential resources through the Counseling and Psychological Services (CAPS 🔗), Religious and Spiritual Life (RSL 🔗) and the Center for Awareness, Response and Education (CARE 🔗).