



CEN 326 Fluid Mechanics and Hydraulic Systems

Winter 2024

Course Credits: 4

Contact Hours: 56 hours

Instructor: TBA

Email: TBA

COURSE OBJECTIVES

This course delves into the intricate world of fluid mechanics and hydraulic systems, building upon fundamental principles to explore complex applications. The curriculum begins with a comprehensive review of fluid mechanics fundamentals, providing a solid foundation for subsequent topics. The main focus is on flow in complex pipe systems; theory and operations of centrifugal pumps, unsteady flows; hydraulic models and more.

Upon Completion of this Course, students will be able to:

1. Revisiting core principles of fluid mechanics to ensure a strong grasp of foundational concepts;
2. Analyzing fluid flow in intricate pipe networks, considering factors such as pressure, velocity, and friction losses;
3. Understanding and calculating backwater effects in rivers and channels, with a focus on water surface profiles in response to obstructions;
4. Exploring various methods and technologies for accurate measurement of fluid flow rates in different hydraulic scenarios;
5. Exploring basic concepts of wave theory, with a focus on their relevance to hydraulic systems and coastal engineering.

PREREQUISITES

CEN 215 Fluid Mechanics

GRADING



Grades will be determined by accumulating points, with 100 points being the maximum, as follows:

ITEM	POINTS
3 Projects	30 Points
2 Exercises	20 Points
Midterm	20 Points
Final Exam	30 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

$$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F.$$

We reserve the right to make adjustments to the overall grading policy.

COURSE MATERIALS

Required Texts:

1. Terry W. Sturm, *Open Channel Hydraulics*, 3rd Edition, McGraw-Hill, 2021.
2. Joseph A. Untener; Robert L. Mott, *Applied Fluid Mechanics*, 8th Edition, Pearson, 2022.
3. Ven Te Chow, *Open-channel Hydraulics*, Illustrated Edition, Blackburn Press, 2009.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	Topics: Topic 1: Characteristics of Open Channel Flow Topic 2: Solution of Open Channel Flow Problems Topic 3: Recommended Velocity of Flow in Pipe and Tubing Topic 4: Uniform Flow Assessments: Project#1



Module 2	Topics: Topic 5: Flow Measurement Topic 6: Mass Flow Measurement Topic 7: Backwater computations Topic 8: Application to Stable Channel Design Assessments: Project#2 Exercise#1
Module 3	Topics: Topic 9: Small Centrifugal Pumps Topic 10: Centrifugal Grinder Pumps Topic 11: Manufacturers' Data for Centrifugal Pumps Topic 12: Governing Equations of Unsteady Flow Assessments: Midterm Project#3
Module 4	Topics: Topic 13: Computational Fluid Dynamics Topic 14: Sediment Discharge Topic 15: Kinematic Wave Routing Topic 16: Monoclonal Wave Profile Assessments: Exercise#2
Module 5	Topics: Topic 17: Three-Dimensional CFD Modeling for Open Channel Flows Topic 18: HEC-RAS Bridge Modeling Implementation Topic 19: WSPRO Model Topic 20: Application to Stable Channel Design Assessments: Final Exam

ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning



and might be prohibited from attending final exam.

2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

LEARNING REQUIREMENTS

- 1) Late assignments are not acceptable and are subjected to grade deductions.
- 2) Assignments submitted in the wrong format will be counted as not submitted.
- 3) Failure to submit or fulfill any required course component results in failure of the class.
- 4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
- 5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

TECHNOLOGY POLICY

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

ACADEMIC INTEGRITY POLICY

Soochow University highly values the academic integrity and aims to promote the academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.



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DISABILITY ACCOMMODATION

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.