



蘇州大學
Soochow University

CEN 225 Introduction to Fluid Mechanics

Winter 2024

Course Credits: 4

Contact Hours: 56 hours

Instructor: TBA

Email: TBA

COURSE OBJECTIVES

This course provides students with an introduction to principal concepts and methods of fluid mechanics. Topics covered in the course include pressure, hydrostatics, and buoyancy; open systems and control volume analysis; mass conservation and momentum conservation for moving fluids; viscous fluid flows, flow through pipes; dimensional analysis; boundary layers, and lift and drag on objects. Students will work to formulate the models necessary to study, analyze, and design fluid systems through the application of these concepts, and to develop the problem-solving skills essential to good engineering practice of fluid mechanics in practical applications.

Upon completion of this course, students will be able to:

1. Define basic terms, values and laws in the areas of fluids properties, statics, kinematics and dynamics of fluids, and hydraulic design of pipes
2. Describe methods of implementing fluid mechanics laws and phenomena while analysing the operational parameters of hydraulic problems, systems and machines
3. Practically apply tables and diagrams, and equations that define the associated laws
4. Calculate and optimise operational parameters of hydraulic problems, systems and machines
5. Explain the correlation between different operational parameters
6. Select engineering approach to problem solving based on the acquired physics and mathematical knowledge



PREREQUISITES

CEN 115 Engineering Mechanics

GRADING

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

ITEM	POINTS
Quizzes	10 Points
Lab Reports	20 Points
Midterm 1	15 Points
Midterm 2	15 Points
Final Exam	40 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:

Bruce R. Munson, Theodore H. Okiishi, Wade W. Huebsch, and Alric P. Rothmayer, *Fundamentals of Fluid Mechanics*, 7th Edition, John Wiley and Sons, 2013.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
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Module 1	<p>Topics: Topic 1: Fluid and its Physical Properties Topic 2: Steady and Unsteady Flow Topic 3: Streamlines Topic 4: Couette Flow and Newton's Law of Viscosity, Reynolds Number</p> <p>Assessments: Quiz#1 Lab Report#1</p>
Module 2	<p>Topics: Topic 5: Hydrostatics Topic 6: Momentum Principle and Equations Topic 7: Pressure Drop, Mass/Volume Flow Topic 8: Bernoulli's Equation and its Physical Meaning</p> <p>Assessments: Quiz#2 Lab Report#2</p>
Module 3	<p>Topics: Topic 9: Flow Measurement Topic 10: Flow Speed and Volumetric Flow Rate, Applications of Bernoulli Equation Topic 11: One-dimensional Energy Equation Topic 12: Laminar and Turbulent Flow, Boundary Layer</p> <p>Assessments: Midterm#1 Lab Report#3</p>
Module 4	<p>Topics: Topic 13: Index and Logarithmic Laws, Wall-Roughness Topic 14: Velocity Profile, Losses in Pipes Topic 15: Frictional Losses. Nikuradse Experiments Topic 16: Moody's Diagram, Hydraulic Grade Lines</p> <p>Assessments: Midterm#2 Lab Report#4</p>
Module 5	<p>Topics: Topic 17: Dimensional Analysis, Theory of Similarity Topic 18: Pump Types and Characterisation Topic 19: Flow of Fluid in Open Channels Topic 20: Non-Stationary Flow and Hydraulic Shock</p> <p>Assessments: Final Exam</p>



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).



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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.

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.