ME 342 - Fluid Mechanics

Spring 2025 Syllabus

Lecture:

Section A: MWF 12pm-1pm McLean 414
Section B: MWF 1pm-2pm EAS 230
Section D: MWF 12pm-1pm Carnegie 316

Instructor:

Prof. Kevin Connington (Sections A & B)

Office:	Carnegie-210
Office Hours:	Updated on Canvas
Email:	kevin.connington@stevens.edu

Prof. Jason Rabinovitch (Section D)

Office:	EAS-323
Office Hours:	Updated on Canvas
Email:	jrabinov@stevens.edu

Teaching Assistants:

Updated on Canvas

Textbook:

Frank M. White & Henry Xue, Fluid Mechanics, 9th Edition, McGraw-Hill, 2021 (ISBN 978-1-260-25831-8)

Grading:

Homework	12%
Labs	15%
Quizzes	51% - 3 @ 17%
Final	22%

Homework:

Homework is to be submitted online through Canvas as a single pdf document. There are many free apps and programs that are available to create pdf documents; see the instructor if you are having trouble creating the files.

A reasonable amount of time($\sim$ one week) will be given to complete all homework assignments. Late homework will not be accepted past the due date. **Please make sure that your file was uploaded properly.**

The Canvas submission will be set so that the homework is due at 5pm (soft cutoff), but will be left open to submission until midnight (hard cutoff). Note that if the deadline is set for 5pm, you must submit your work no later than 4:59 for Canvas to count it as on-time. If the homework is submitted any time between 5pm and midnight, 10% will automatically be deducted from the assignment. If the assignment is not submitted by midnight, it will not be accepted.

Forgetting to upload your file or improperly uploading your file are not valid excuses; in that case your homework will be treated as late and not accepted.

If there is an error in the submission process that prevents you from uploading the file, email the instructor immediately with the file attached.

In order to provide some flexibility for unavoidable circumstances, the *two lowest* homework grades will be dropped.

Show all your work for the problems. A grader must be able to reasonably follow your work from line to line. If it is unclear how you arrived at an answer, points may be deducted.

Include your name, class section, homework number, due date, Stevens pledge, and signature on each submitted assignment.

Labs:

Labs will be performed as a group outside of class, taking about 30-45 minutes to complete. The TA will provide a schedule of possible time slots for you to run the lab, where you may sign up (through Canvas) for whichever slot is most convenient. You may change your time slot while the sign-up period is open, but once the sign-up period is closed you are committed to that slot. Since there is a single Canvas shell for all sections, you may form a group with anyone else in the class, even if they are in a different section.

Anyone that does not sign up for a lab or contact the instructor about a conflict during the sign up period will have their report **grade deducted 10%**.

Anyone that does not show up for their time slot will be taken on a case by case basis. If you have a valid excuse for missing your time, you may run the lab with another group, but your excuse must be approved by the instructor (not the TA) first. If there is not a valid excuse, we will try to place you with another group, but a **25% penalty will be deducted.** This penalty will be applied to cases such as oversleeping, forgetting to run the lab, or running with the wrong group. The TA's will take attendance and will not allow students to run the lab if they are not officially signed up for that time slot, unless they have written permission from the instructor. If you miss your time slot and are not able to make it up, you will receive no credit for the assignment.

The labs are run in EAS-002c, but you first have to enter the outer room, EAS-002. The outer room is best accessed by walking west through the Design 1 Lab in the basement of EAS.

For group labs, the group will turn in a single lab report, where each person must participate in writing the report. The submission procedure and rules, i.e. through Canvas, are the same as for the homework. Indicate your group number on your report; there will be a single point deduction for reports without a group number.

For all group labs, the instructor will provide an anonymous group participation survey. Each group will be returned their graded lab report with the 'group' grade, but individual grades will be adjusted according to the participation survey. **In the extreme case that a student contributes nothing toward writing the report, they will receive a** 0%**.**

The group grade is based solely on the report that is submitted. It is the responsibility of everyone in the group to make sure all contributions are completed by the time the report is submitted.

Cylindrical tube viscometer:	Ch. 1-2
Force of a jet:	Ch. 3
Entrance length for pipe flow (demo):	Ch. 6
Lift on an airfoil (demo):	Ch. 7

Exams:

All exams are closed textbook, but you may bring an equation sheet. You are allowed one sheet, front and back, of *hand-written* equations for all exams. The most important aspect is that there are **NO SOLVED PROBLEMS**. You must write your name on the equation sheet and submit it with your exam. The TA will look over your equation sheet to confirm there are no solved problems. Any violation of this policy will be forwarded to the Honor Board.

There are some tables in the appendix that will be necessary for the exams. The instructor will provide those tables at the exam so you do not have to include them on your equation sheet. The instructor will post the handout in advance of the exam so you know what will be included.

The final exam will focus on the newest material, but problems will require knowledge of previous chapters, and so can be considered cumulative in a sense. Problems specific to previous exams will not be asked, but you are expected to be able to use basic concepts of fluid mechanics such as viscosity, buoyancy, etc.

Q1: Ch.1 & Ch.2
Q2: Ch.3
Q3: Ch.4 & Ch.5
F: Ch.6, 7, & 11

If you are entitled to testing accommodations, it is your responsibility to contact the TA in charge of exams (see page on Canvas for contact info) with sufficient advanced notice to arrange your accommodations.

Topics:

Chapter 1: Introduction (Fundamental Concepts)
Chapter 2: Pressure Distribution in a Fluid (Fluid Statics)
Chapter 3: Integral Relations for a Control Volume
Chapter 4: Differential Relations for Fluid Flow

Chapter 5: Dimensional Analysis and Similarity
Chapter 6: Viscous Flow in Ducts (Internal Flow)
Chapter 7: Flow Past Immersed Bodies (External Flow)
Chapter 11: Turbomachinery

Name and Pronoun Usage:

As this course includes group work and in-class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect. This includes the ability for all students to have their chosen gender pronoun(s) and chosen name affirmed. If the class roster does not align with your name and/or pronouns, please inform the instructor of the necessary changes.

Inclusion Statement:

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in academic discourse and innovation. In this class, the perspective of people of all races, ethnicities, gender expressions and gender identities, religions, sexual orientations, disabilities, socioeconomic backgrounds, and nationalities will be respected and viewed as a resource and benefit throughout the semester. Suggestions to further diversify class materials and assignments are encouraged. If any course meetings conflict with your religious events, please do not hesitate to reach out to your instructor to make alternative arrangements. You are expected to treat your instructor and all other participants in the course with courtesy and respect. Disrespectful conduct and harassing statements will not be tolerated and may result in disciplinary actions.

Course Outcomes:

1. You are able to demonstrate how to use fluid mechanics properties and parameters including density, specific weight, viscosity, velocity, pressure, etc., while solving fluid mechanics problems.
2. You are able to analyze fluid mechanics problems involving hydrostatics.
3. You are able to use control volume analysis and conservation of mass, conservation of linear or angular momentum, the Bernoulli equation, and/or conservation of energy to solve fluid flow problems.
4. You are able to use the Navier-Stokes equations and potential flow theory to solve fluid flow problems.
5. You are able to use dimensional analysis (including Buckingham Pi theorem) for scaling experimental results.
6. You are able to analyze fluid mechanics problems involving viscous flow in ducts.
7. You are able to analyze external flow (drag and lift) problems.
8. You have demonstrated the ability to communicate effectively in the fluid mechanics laboratory written reports.
9. You have demonstrated a strong ability to function on your team while conducting the fluid mechanics laboratory experiment and preparing the written report.
10. You are able to conduct experiments related to fluid mechanics and quantify the uncertainty of physical measurements.