MARTHA BRADLEY EVANS
Center for Teaching Excellence
THE UNIVERSITY OF UTAH

Intermediate Fluid Mechanics 5700/6700

Fall Semester 2025

Course Description

This three credit-hour course serves as an introduction to fluid dynamics at the graduate level and is intended primarily for first-year graduate students (ME EN 6700) and senior-year undergraduate students (ME EN 5700). A variety of higher-level topics in classical fluid dynamics will be covered in order to provide students with a strong foundation to pursue advanced study in any area of fluid dynamics. The lecture material and homework will be supplemented by experimental projects that will help to reinforce course objectives as detailed below.

Course Outcomes

Given a real-world fluid dynamics problem, students will be able to simplify the problem through an understanding of the fundamental equations of motion and determine an optimal approach to solving it.

Course Objectives

Students will master engineering skills for (i) solving fluid dynamics problems through the use of both physical and mathematical modeling, and (ii) interpreting results in the context of real-world applications and observations. These skills will include:

- Understanding basic descriptive terminology of fluid dynamics,
- Gaining an appreciation for the kinematics of fluid motion by connecting mathematics to flow visualization observations,
- Utilizing fundamentals of mathematics and physics to determine the governing equations of fluid dynamics,
- Developing a physical understanding of the terms in the governing equations that describe fluid motion,
- Determining important non-dimensional parameters in fluid flows and how these are used in scale analysis and model testing,
- Gaining an ability to describe fluid motion through vorticity dynamics,
- Understanding the basic behavior and mathematical theory of turbulent boundary layers,
- Analyzing experimental data and comparing it to theory,
- Use of Python, Matlab, or other to solve fluid dynamics problems and visualize results.

Course Requirements

Your progress and learning in the course will be evaluated through a combination of Quizzes, Homeworks, Exams, and Lab/Project assignements. The credit for each of these activities will be splitted as follows,

- Quizzes – 25%
- Homework assignments – 10%
- Labs/Project – 15%
- Mid-term Exam – 20%
- Final Exam – 30%

Quizzes: Quizzes will occur during the semester on a weekly basis, depending on the complexity of the recent lecture topics. The quiz questions will be made publicly available on CANVAS. Responses will also be submitted through CANVAS. The quiz questions will follow the course material explored the previous lectures. Each quiz will be graded on a scale of 0-100 points. Make-up quizzes are not allowed, but the lowest quiz score will be dropped.

Homework: Homework MUST be completed individually. Students may NOT use the solution manual to complete the assigned homework problems (see Academic Misconduct). Homework is to be submitted electronically through CANVAS (further details will be provided in class) by midnight on the assigned due date. Late homework will be accepted up to 2 days following the original due date (weekends count as regular days regarding late homework). Homework solutions will be made available on the Canvas course site 2 days after the original due date. The late penalty is 25% per day. This penalty will be assessed unless there are extenuating circumstances (i.e. documented illness); however, homework may be submitted early if you know you will miss the class when it is due. The lowest homework grade will be dropped. See Late Policy for further details.

Project/Labs: There will be three labs during the semester. The first one will be a "demonstration" lab that highlights the available equipment. The second one will involve an experiment conducted in the Fluid Mechanics Lab to measure and visualize the flow around and behind an object of the student's choice using Particle Imaging Velocimetry. The last lab will involve the creation of a short fluids video, to be posted on YouTube, based on the experiment of the student's own design. Students may work in

teams of 2-4 to complete the labs.

Midterm and Final Exams: There will be one midterm exam, with tentative dates indicated in the Course Schedule included on CANVAS (note however that the precise dates might be subject to change; check Canvas for updates). You must work independently on each exam and they will be closed-book and closed-notes. No electronic devices will be allowed during exams except a non-graphing, non-programmable scientific calculator. Calculator phone apps are not allowed. You will be given an equation sheet. The equation sheet will be published on Canvas before the exam so you know what is on it. If you are unable to take an exam at the scheduled time, notify the instructor as soon as possible. In the event of a missed exam, the student will be required to provide a valid explanation for the absence in order to complete a make-up exam.

Grading Scale

A	88 – 100%
B	76 – 87.9%
C	64 – 75.9%
D	52 – 63.9%
E	< 52%

(*Grade ranges include +/-; for example, B-, B, and B are in the 76-88% range. At the instructor's discretion, the final grading scale may be curved downward (i.e., the percentages associated with each letter grade may be decreased) based on overall class performance, which can only raise student grades.*)

Grading Corrections:

Grading correction request for homework assignments, lab reports, quizzes, and exams must be submitted within 1 week of receiving the graded work. Each individual request must be accompanied by a written explanation of the grading error.

University Policies

Updated mandatory syllabus policies regarding the ADA Act, Safety at the U, Addressing Sexual Misconduct, and Academic Misconduct can be viewed at:
https://cte.utah.edu/instructor-education/syllabus/institutional-policies.php

Class Policies:

a) Students are responsible for all material covered in class.
b) All work (homework, projects) submitted for grading should represent your individual effort. However, studying and working with your peers (on outside class assignments) is not only acceptable, but greatly encouraged. Study groups can provide an extremely valuable resource to students, and you are encouraged to join one.
c) Submitting work copied from others or from a solutions manual will be considered academic misconduct. Plagiarism of ideas or work as well as giving or receiving unauthorized information on examinations will be considered academic misconduct. All academic misconduct will be dealt with severely and may result in a course grade of E. Refer to University Regulations - Chapter X Student Code in the University Class Schedule/Student Handbook for further information.
d) Both students and the instructor have the responsibility to be courteous and respectful to others in class. Please refrain from the use of cell phones, laptops, tablet computers (except for note taking), outside reading, or extensive conversations.

Further, the Price College of Engineering Guidelines can be found in
https://www.coe.utah.edu/semester-guidelines

Academic Conduct:

Students are strongly encouraged to work together in small study groups to understand the concepts presented during the course; however, all homework MUST reflect the student's individual effort. If students choose to work in small teams for the projects, then every student in the team MUST contribute equally to the overall team effort. Any instance of academic misconduct (cheating), for example copying of someone else's work, will result in a zero for the assignment and might carry additional academic implications as per the Price College of Engineering policies.

Class Attendance:

a) It is your own decision whether to attend or not class.
b) If you have a University athletic or academic activity or a business engagement, please contact the instructor before you leave to determine appropriate accommodations for the absence.
c) If you are absent for any other reason, please contact your classmates for any

pertinent material. Do not see the instructor for notes or handouts.