THE UNIVERSITY OF COLORADO BOULDER

ASEN 3711: Aerodynamics
Spring 2026

SYLLABUS

Instructor: Professor John Farnsworth
E-Mail Address: john.farnsworth@colorado.edu

Lecture: Tuesday/Thursday, 10:00 AM – 11:15 AM (AERO 120)

Study Hall: Tuesday, 5:30 – 7:00 PM (AERO 111)
Thursday 5:30 – 7:00 PM (AERO 111)

Web Page: Canvas (https://canvas.colorado.edu)

Course Objectives:

The primary course objective is to introduce and develop models for the analysis of subsonic, transonic, and supersonic flow. A significant focus is placed upon developing a fundamental understanding of the origins and magnitude of aerodynamic forces and moments experienced by aircraft and spacecraft, and to develop methodologies for the modeling and prediction of such forces and moments. Additional focus is placed on developing a fundamental understanding of gas dynamics in nozzles and diffusers with application to aircraft and rocket propulsion.

Learning Goals:

Establish a level of competency in the following topics such that you may use this expertise in the design of operational aircraft and spacecraft.

1. **Fundamentals**
    a. Vector Calculus
    b. Fluid Mechanics
    c. Aerodynamics
    d. Gas Dynamics
2. **Origins of Lift**
    a. Airfoils and Circulation
    b. Subsonic Wings
    c. Wing Sweep
    d. Supersonic Wings
3. **Origins of Drag**
    a. Skin Friction Drag
    b. Form Drag
    c. Induced Drag
    d. Transonic Compressibility Drag
    e. Supersonic Wave Drag
4. **Modeling and Prediction of Lift and Drag**
    a. Potential Flow Theory
    b. Incompressible Thin Airfoil Theory
    c. Compressible Thin Airfoil Theory
    d. Panel Methods
    e. Prandtl Lifting Line Theory

Textbook, References, and Material:

Fundamentals of Aerodynamics, J. D. Anderson and C. P. Cadou, 7th Edition, McGraw Hill, 2024.

- *Older editions are also acceptable but may have minor differences in text and problems from those assigned from the 7th Edition. It is the student's responsibility to identify any differences and complete the appropriate homework and reading assignments.*

Course Website and E-Mail List:

There will be a class website on Canvas. All relevant documents, schedules, and supplemental materials will be posted to this site throughout the semester. Please check back to see what has been posted. All course announcements outside of lecture will be sent as Canvas announcements, so it is the student's responsibility to make sure their Canvas settings are appropriately configured to receive these announcements.

Students should e-mail the teaching team if they have a pressing logistical or health issue. The teaching team will aim to respond to e-mails within one business day. Email should **not** be used to ask technical questions about the content/material discussed in class or assigned in homework, quizzes, or exams. All questions on assignments, quizzes, exams, and course content should be asked during lectures, office hours, or at the assigned study hall times.

Course Format:

The course will follow a traditional lecture format. Homework and concept quizzes will be assigned once per week, and students will be given approximately one week to complete each. There will be three midterm exams throughout the semester and a comprehensive final exam at the conclusion of the semester. Student assessment will be based on homework assignments, concept quizzes, in class activities, midterm exams, and the final exam. All the exam dates and times are defined in the appropriate sections below. Students should reserve these in their schedules as no make-up opportunities will be provided.

Grading:

Course grades will be assigned based on the following percentages:

45% Midterm Exams (3 x 15%)
25% Final Exam
10% Homework
10% Concept Quizzes
10% In-Class Activities

Grades will be posted to the course website on Canvas.

Letter Grading Scheme:

Letter grades will be assigned as follows:

Letter Grade	Percent Grade	4.00 Scale
A	93.00 – 100.00	4.00
A-	90.00 – 92.99	3.67
B+	87.00 – 89.99	3.33
B	83.00 – 86.99	3.00
B-	80.00 – 82.99	2.67
C+	77.00 – 79.99	2.33
C	73.00 – 76.99	2.00
C-	70.00 – 72.99	1.67
D	60.00 – 69.99	1.00
F	Below 60.00	0.00

All three midterm exams as well as the final exam will be curved (uniform or linear adjustment based upon assessed passing/competency grade for the exam), while the homework, quizzes, and in class activities will not be curved.

Remarks on Grading:

Our grading scheme is not designed to reward or punish. It is designed to indicate your level of competency compared to the standard that we set. Do you meet the minimum level of competency? Do you exceed the minimum? Are you below the minimum? The answers to these questions should be indicated by your final grade.

The final grade indicates your readiness to continue to the next level of courses. Meeting the minimum requirements indicates that you are prepared to continue at least at the minimum level required for the next in the sequence of courses. Exceeding the minimum means you are ready to enter the next course and that you have mastery of material beyond the minimum, that is, you show some level of proficiency.

Re-Grading:

All re-grade requests must be made within two weeks of receiving the grade for an assessment. This policy applies to homework, exams, and quizzes. All re-grade requests must be submitted electronically through the Gradescope application where the homework assignments/exams are graded or via email to the full teaching team (instructor, teaching assistant, and teaching fellows) for quizzes in Canvas. Re-grade requests made verbally but not put into writing or requested officially online will not be addressed.

Homework Policy:

Homework will be assigned every Tuesday during lecture to be due the next Tuesday before midnight **(11:59 PM on the due date).** Homework assignments will be submitted electronically to Gradescope. If you must miss class for an excused absence, you may submit your homework early. Late assignments will not be accepted under any circumstance. However, the lowest homework grade will be dropped from the average homework grade. Each homework assignment will be worth 10 points. Homework submissions will be graded for "completeness", and solutions will be posted for self-assessment of "correctness".

Collaboration is permitted on homework. You may discuss the means and methods for formulating and solving problems and even compare answers, but you are not free to copy someone else's assignment. ***Copying material from any resource (including solutions manuals) and submitting it as one's own is considered plagiarism and is an Honor Code violation.*** Students who are caught copying material, from either the solution manual or peer assignments, will receive a zero "Homework" grade for the class. Remember, the less you think about the problems yourself, the less you actually learn, and the more difficult it will be to succeed on exams.

Homework is meant both as a mechanism for students to learn and apply course material as well as practice solving problems for the midterm and final exams. As such, students should approach the homework assignments as if they were graded for "correctness". Students should strive to demonstrate an understanding of the principles involved by including diagrams, using correct notation and terminology, explaining the approach, showing the key steps to obtaining the solution, and outlining the answer with proper units. Students should also submit work with a professional appearance.

Concept Quiz Policy:

There will be a minimum of 10 concept quizzes administered throughout the semester. They will occur each week of the semester except during midterm exam weeks and during the week of spring break. These concept quizzes will be administered as Canvas quizzes, and each quiz will be assigned on a Monday and due on the Friday of the same week at 11:59 PM. Students will have

fifteen minutes to complete each quiz, and students will be able to take the concept quizzes as many times as they like before they are due. The concept quizzes will cover material assigned in readings during the week they are assigned, and they are intended to help students identify, practice, and comprehend important concepts. The concept quizzes will be closed book, and there will be no make-up concept quizzes. However, the lowest concept quiz grade will be dropped.

In Class Activities Policy:

There will be periodic in-class activities (primarily iClicker questions but there could also be short worked out problems or short paper quizzes) during the lecture. These activities are intended to provide practice in applying concepts discussed in lecture, reinforce conceptual understanding, and develop problem solving skills. There will be no make-up in class activities for missed lectures. However, up to 10% of the points allocated to in-class activities will be dropped from the final grade to provide flexibility for attendance.

Midterm Exam Policy:

There will be three midterm exams:

> **Midterm Exam 1: 12 February 2026:** Fundamentals and Potential Flow
> **Midterm Exam 2: 12 March 2026:** Incompressible Flow About Airfoils and Finite Wings
> **Midterm Exam 3: 16 April 2026:** Compressible Flow and Shock Waves

The midterm exams will cover all material in the course including lectures, readings, and assignments.

Each midterm exam will consist of two parts. The first part will be fully closed book and will test understanding of concepts. The second part will be closed book except for equation sheets and charts provided by the instructor and will involve derivation and problem solving. Collaboration on the midterm exams will not be tolerated. Students who are caught in these activities will receive an "F" for the course and reported to the Dean's office for further punitive action.

There will be no makeup midterm exams. If you are unable to attend a particular midterm exam due to an excused or in-excused absence, your midterm examination grade will be replaced by your final exam grade associated with the missed midterm material.

The course is broken into three topics that are assessed through three midterm exams. These same three topics will be tested on the final. Recognizing that testing is never an exact science, your final grade will be calculated from your best percentage of the two topic tests (one from midterm, one from final) according to the following policy. When the better performance on a given topic occurs on the final, the topic score from the final will always be chosen which allows the final to replace any (up to all) midterm scores. However, for a midterm topic score to replace a lower topic score on the final, a student must score at least a 70% on the topic score from the final (after accounting for any curve applied). Thus, failing a topic on the final will result in that topic score being used in the final exam score with the weighting described at the start of the Grading section above.

Final Exam Policy:

There will be a comprehensive final exam on Monday 27 April 2026, from 1:30 pm to 4:00 pm. The final exam schedule is dictated by the University of Colorado Boulder registrar's office and cannot be changed or modified. As a result, the exam cannot be offered early, and no make-up exams will be permitted. Students are advised to plan their end of semester schedules accordingly. Additional CU Boulder Campus policies related to the administration of the final exam can be found here: https://www.colorado.edu/compliance/policies/final-examination-policy.

The final exam will cover all material in the course including lecture, readings, and assignments.

The final exam will consist of two parts. The first part will be fully closed book and will test understanding of concepts. The second part will be closed book except equation sheets and charts provided by the instructor and will involve derivation and problem solving. Collaboration on the final exam will not be tolerated. Students who are caught in these activities will receive an "F" for the course and reported to the Dean's office for further punitive action.

If a student has an "A" (93 and above) midterm exam grade for each midterm going into the final exam, the student may elect to not take the final exam. In this case, the student's midterm exam average grade will replace the student's final exam grade. ***Students qualifying for this option will be notified by no later than the end of business on the last day of class, Friday 24 April 2026***.

Reading Assignments Policy:

There will be reading assignments associated with each lecture. These assignments may be found on the course schedule. These reading assignments are to be completed before the lecture. The lecture and discussions should help to clarify and supplement what you have read.

Attendance Policy:

Students are strongly encouraged to attend all scheduled lectures. Expect new material to be presented in the lecture. Exams will cover all the material in the course, including lectures and homework. All lectures will be recorded via Classroom Capture for asynchronous review (not live Zoom). In class activities will not be available to those who do not attend the lecture where they are given (see In Class Activities above). The instructor is not responsible for any audio-visual issues associated with the recording and accessibility of these lectures through the OIT systems and lectures will only be recorded (or re-recorded) outside of lecture when the original in-person lecture is canceled or interrupted.

Classroom Behavior:

Students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote, or online. Failure to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, marital status, political affiliation, or political philosophy.

Additional classroom behavior information:

- Student Classroom and Course-Related Behavior Policy.
- Student Code of Conduct.
- Office of Institutional Equity and Compliance.
- Student Code of Conduct.
- Office of Institutional Equity and Compliance.

Honor Code:

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the Honor Code may include but are not limited to: plagiarism (including use of paper writing services or technology [such as essay bots]), cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. Understanding the course's syllabus is a vital part of adhering to the Honor Code.

All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution: StudentConduct@colorado.edu. Students found responsible for violating the Honor Code will be assigned resolution outcomes from Student Conduct & Conflict Resolution and will be subject to academic sanctions from the faculty member. Visit Honor Code for more information on the academic integrity policy.

Acceptable Use of AI in this Class:

Generative artificial intelligence tools—software that reproduces text, images, computer code, audio, video, and other content—have become widely available. Well-known examples include ChatGPT for text and DALL•E for images. This statement governs all such tools, including those released during our semester together.

Keep in mind that the goal of gen AI tools is to reproduce content that seems to have been produced by a human, not to produce accurate or reliable content; therefore, relying on a gen AI tool may result in your submission of inaccurate content. It is your responsibility—not the tool's—to assure the quality, integrity, and accuracy of work you submit in this course and any other professional activity or college course.

If gen AI tool use is suspected in completing assignments for this course in ways not explicitly authorized, the course instructor will follow up with you and may contact the Office of Student Conduct & Conflict Resolution to report suspected Honor Code violations. In addition, you must be wary of unintentional plagiarism or data fabrication. Please act with integrity, for the sake of both your personal character and your academic record.

The use of gen AI tools is not permitted for this course. All assignments turned in within this course are expected to be your original work and minimal writing tasks will be assigned; meaning the use of gen AI tools for spelling, grammar, and language checking will be unnecessary within the extent of this course.

Accommodation for Disabilities, Temporary Medical Conditions, and Medical Isolation:

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or DSinfo@colorado.edu for further assistance.

If you have a temporary illness, injury or required medical isolation for which you require adjustment, please contact the professor to coordinate for necessary accommodations. Also see Temporary Medical Conditions on the Disability Services website if you have a temporary medical condition for which you believe you may require accommodations.

Timed Assessment Accommodations Policy:

As an Aerospace Engineering Sciences departmental policy, students should expect to receive accommodations for a timed assessment (e.g., exam) only if their faculty instructor(s) receive the student's accommodations letter at least 5 business days prior to the assessment; in order to provide the appropriate time to facilitate administering the assessment.

Accommodation for Religious Obligations:

Campus policy requires faculty to provide reasonable accommodations for students who, because of religious obligations, have conflicts with scheduled exams, assignments, or required attendance. Please communicate the need for a religious accommodation in a timely manner. In this class, you must contact the professor at least two weeks in advance of any religious obligations which will conflict with class activities. See the campus policy regarding religious observances for full details.

Preferred Student Names and Pronouns:

CU Boulder recognizes that students' legal information does not always align with how they identify. If you wish to have your preferred name (rather than your legal name) and/or your preferred pronouns appear on your instructors' class rosters and in Canvas, visit the Registrar's website for instructions on how to change your personal information in university systems.

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation:

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits protected-class discrimination and harassment, sexual misconduct (harassment, exploitation, and assault), intimate partner abuse (dating or domestic violence), stalking, and related retaliation by or against members of our community on- and off-campus. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who have been subjected to misconduct can contact OIEC at 303-492-2127 or email OIEC@colorado.edu. Information about university policies, reporting options, and OIEC support resources including confidential services can be found on the OIEC website.

Please know that faculty and graduate instructors are required to inform OIEC when they are made aware of incidents related to these concerns regardless of when or where something occurred. This is to ensure the person impacted receives outreach from OIEC about resolution options and support resources. To learn more about reporting and support a variety of concerns, visit the Don't Ignore It page.

Mental Health and Wellness:

The University of Colorado Boulder is committed to the well-being of all students. If you are struggling with personal stressors, mental health or substance use concerns that are impacting academic or daily life, please contact Counseling and Psychiatric Services (CAPS), located in C4C, or call (303) 492-2277, 24/7.

Prepared by: John Farnsworth (Revised: 07 January 2026)