



ASEN 2702: Introduction to Thermodynamics and Aerodynamics

Spring 2024

Instructional Team
Jeff Glusman
Alexandra Le Moine

 Ann and H.J. Smead
Aerospace Engineering Sciences
UNIVERSITY OF COLORADO BOULDER

Section 001: M/W 3:00PM – 4:15PM, Aero 111

Thermodynamics Instructor	Jeff Glusman (he/him/his) Email: Jeff.Glusman@colorado.edu Office: Aero N205
Aerodynamics Instructor	Alexandra Le Moine (she/her/hers) Email: Alexandra.LeMoine@colorado.edu Office: Aero N209
Teaching Assistant	Austin Coleman (austin.coleman@colorado.edu)
Teaching Facilitator	Liza Graybill (liza.graybill@colorado.edu)
Instructional Team Office Hours	See Canvas for current information about office hours.

COURSE TEXTBOOKS (Loose-leaf or eBook of both texts is required):

1. Cengel, Y., Cimbala, J., & Ghajar, A. (2021). *Fundamentals of thermal-fluid sciences* (6th ed.). McGraw-Hill Education.
2. Anderson, J., & Bowden, M. (2021). *Introduction to Flight* (9th ed.). McGraw-Hill Education.

COURSE WEBSITE –

COURSE PREREQUISITES - APPM 1350/1360, PHYS 1110 or equivalent

COURSE COREQUISITES - APPM 2350 or equivalent, ASEN 2012

COURSE PURPOSE - Introduce the fundamental concepts and principles of thermodynamic and fluid dynamic systems. The focus is on areas of general importance to the aerospace engineering discipline. The primary goal is the synthesis of basic science (physics), mathematics, experimental methods for quantitative analyses, and design of general aerospace technology systems.

COURSE OUTCOMES - By the end of this course, you should be able to:

Thermodynamics

- Define the state of a pure substance and understand how to use property tables.
- State the 1st Law of Thermodynamics and define heat, work, and the difference between various forms of energy.
- Identify and describe energy exchanges processes (in terms of various forms of energy, heat,

and work) in engineering systems.

- Apply the 1st Law of Thermodynamics to a closed system to estimate the required balances of heat and work.
- Apply the 1st Law of Thermodynamics to an open system to estimate the required balances of heat, work, and flow energy.

Aerodynamics

- Understand the elementary and fundamental concepts of aerodynamics.
- Apply Continuity, Euler's, Bernoulli's, and Energy Equations.
- Solve basic aerodynamic problems involving inviscid and viscous flow.
- Solve basic aerodynamic problems involving incompressible and compressible flow.
- Understand the fundamental concepts of aerodynamic bodies and two-dimensional lift and drag.

POLICIES AND PROCEDURES

I. STUDENT EXPECTATIONS

- Students are expected to attend all class sessions in addition to completing all assignments by the requested deadline.
- For most students striving for B grades or higher, **we recommend that you schedule at least 3-5 hours per week for engaging with this course outside of weekly lecture and homework assignments.** Your background knowledge/experience and other variables may require you to spend additional time. Please plan accordingly by scheduling time on your calendar now. Several factors influence student academic performance and long-term learning. Active engagement in all course activities (e.g., class participation, readings, homework, assignments, studying, etc.) will contribute to your learning and to success in this course. According to research, a metacognitive learning approach combined with practice testing and distribution of practice over time is most effective. The instructional team is available if you are seeking more information on how to be successful in this course. Your academic advisor is another helpful resource to assist you in meeting the requirements of this course.

II. INSTRUCTOR EXPECTATIONS

- You can expect your instructors to be courteous, punctual, well-organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to notify you beforehand if they are unable to keep them; to provide a suitable guest lecturer when they are traveling; and to grade uniformly and consistently according to the posted guidelines.

III. COMMUNICATION

- Communication of any medical or studies-related needs of absence that are known (non-emergency) should be communicated as soon as possible, and (when possible) any expected impact to assignments/exams should be coordinated with the instructor prior to, **not after the fact**, of missing a course deadline.
- **Email** – Email will not be a primary communication method used in course correspondence for general questions about homework, syllabus & class policy, etc. Emails sent to

instructors or TFs on such topics will go unanswered. Students should only email the instructors with questions or concerns regarding individual scheduling conflicts or personal issues. Instead, students are encouraged to use Piazza for general questions about homework, syllabus, class policy, etc.

- **Piazza** – General questions about homework assignments, syllabus & class policy, and assessments should be posted to the Official Course Piazza channel.
- **Canvas** – Canvas is the official webpage for this course. All general announcements, assignments, course materials, and grades will be available via Canvas. Direct Canvas messages to instructor will not be a primary communication method. Any Canvas DM sent to the instructor may go unanswered.
- **Deadlines** – Student communication that occurs within 24 hours of homework, quiz, or exam deadlines, are not guaranteed to be addressed.
- **Hours of Operation** – All correspondence to instructors and TFs will be handled during regular business hours: M-F 8:30-4:30 PM. Any messages sent to the instructional team outside these hours or during the weekend will go unanswered.

IV. HOMEWORK

- **Homework Format** – Homework assignments will be posted on Canvas. Each homework assignment should be completed individually in one person's handwriting. The written work should be uploaded to Gradescope as a PDF. The problems should be submitted in the same order as in the homework assignment (correctly labeled in Gradescope). Your name (last, first) and assignment number should be visible in the upper portion of each page. Each problem must begin on a new page and be clearly labeled. Final answers should be boxed in. To qualify for full credit, each problem should follow the problem-solving method presented in class as follows:

Problem Statement: Paraphrase the problem statement in your own words.

Sketch: Draw a sketch of the system(s) and state(s) that are being considered.

Givens: List and organize all the given information.

Process/Assumptions: List any assumptions given in the problem statement.

Relevant Equations: Write out the governing principles or equations required to solve the problem.

Properties: Use property tables to list out required properties needed to perform analysis. Provide references for all tabulated data used.

Analysis: Provide step-by-step procedure of your analysis. Include numerical values and units. Box in your final answer.

Conclusion/Comments: Answer short answers for questions. Provide 1-2 sentences which comment on the reasonableness of your answer. Write down any observations you have regarding your final answer(s).

- **Late Homework** – No homework submissions will be accepted after the assignment is due unless extenuating circumstances prevented timely submission of the homework. This will be considered on a case-by-case basis and is at the sole discretion of the instructor. Absolutely no homework submissions will be accepted once solutions to the assignment have been posted. Any homework submissions attempted within 1 hour of the deadline, is subject to Murphy's Law ("anything that can go wrong, will go wrong"). If you wait until

the last minute to submit your assignment, and there is an issue with Gradescope then you are liable for any late submissions/missed deadlines.

- **Homework Solutions** – Complete homework solutions will be posted to Canvas shortly after the assignment is due.

V. READING QUIZZES

- **Reading quizzes** – There will be weekly reading quizzes based on the previous week's reading assignments that will be taken online via Canvas. The window to take the online reading quiz will open at 12:00AM on Sunday morning and will close at 11:59PM on Sunday evening. Students may take the quiz at any time during this 24-hour period. Once the quiz is started, students will have 10 minutes to complete the quiz.
- **Missed reading quizzes** – There will be no make-up reading quizzes. The lowest 2 reading quiz grades will be dropped.

VI. EXAMS

- There will be four 75-minute exams during the semester. The first two 75-minute exams will comprehensively cover the thermodynamics topics. The last two 75-minute exams will comprehensively cover the aerodynamic topics. Three exams will be taken during regular lecture, and the fourth exam will be taken during the final exam period. *All exams will be closed-book and closed-notes with an equation sheet and property tables provided. Calculators are allowed on all exams.*
- **Missed Exams** – There will be no make-up exams unless extenuating circumstances caused the student to miss the exam. This will be considered on a case-by-case basis and is at the sole discretion of the instructor.
- **Accommodations** – We schedule a separate room, or rooms, based on accommodation needs to take the exams. Accommodations will only be provided when the instructor has received the official accommodation letter from Disability Services prior to 48 hours of the exam. Official accommodation letters received within 48 hours of the exam cannot be guaranteed. We cannot accept an unofficial accommodation letter from Disability Services.

VII. HOMEWORK & EXAM GRADING

If you believe an error was made in grading your homework or exam, you must make a regrade request via Gradescope within 1 week of the graded assignment return date. All regrade requests will be reviewed and approved by a course instructor. Regrade requests will not be considered once this 1-week window has passed.

- The regrade request must include a respectful and short justification of your claim.
- Disagreement on the established rubric allocation of points will not be considered.
- Points can be added OR removed based on correctness. If a mistake was made in grading and too few points were awarded, the regrade request may increase the final score. If the

professor finds a mistake was made in grading and too many points were awarded, then the regrade request may lower the final score.

VIII. ATTENDANCE

- **Attendance** – Regularly attending lectures is expected. Some material covered in lecture will not be in the textbook. Quizzes and exams can cover all material disseminated in the course including lectures and homework.

IX. CALCULATION OF COURSE GRADE

Grades for this course will be assigned based on the following weighted breakdown:

Assessment	Weight
Reading Quizzes	5%
Homework	15%
Exam 1 (Thermodynamics)	20%
Exam 2 (Thermodynamics)	20%
Exam 3 (Aerodynamics)	20%
Exam 4 (Aerodynamics)	20%

Course grade determinations are absolute and requests for makeup work, submissions of late assignments, or other general exceptions will not be considered. Letter grades are determined from the following table:

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+	67.00 - 69.99	1.33
D	63.00 - 66.99	1.00
D-	60.00 - 62.99	0.67
F	Below 60.00	0.00

CU BOULDER POLICIES

CLASSROOM BEHAVIOR

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail 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, political affiliation or political philosophy. For more information, see the [classroom behavior](#) policy, the [Student Code of Conduct](#), and the [Office of Institutional Equity and Compliance](#).

REQUIREMENTS FOR INFECTIOUS DISEASES

Members of the CU Boulder community and visitors to campus must follow university, department, and building health and safety requirements and all applicable campus policies and public health guidelines to reduce the risk of spreading infectious diseases. If public health conditions require, the university may also invoke related requirements for student conduct and disability accommodation that will apply to this class.

If you feel ill and think you might have COVID-19 or if you have tested positive for COVID-19, please stay home and follow the [guidance of the Centers for Disease Control and Prevention \(CDC\) for isolation and testing](#). If you have been in close contact with someone who has COVID-19 but do not have any symptoms and have not tested positive for COVID-19, you do not need to stay home but should follow the [guidance of the CDC for masking and testing](#).

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 medical condition, see [Temporary Medical Conditions](#) on the Disability Services website.

PREFERRED STUDENT NAMES AND PRONOUNS

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

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.

All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution: honor@colorado.edu, 303-492-5550. Students found responsible for violating the [Honor Code](#) will be assigned resolution outcomes from the Student Conduct & Conflict Resolution as well as be subject to academic sanctions from the faculty member. Visit [Honor Code](#) for more information on the academic integrity policy.

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 sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, [protected-class](#) discrimination and harassment, and related retaliation by or against members of our community on- and off-campus. These behaviors harm individuals and our community. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who believe they have been subjected to misconduct can contact OIEC at 303-492-2127 or email cureport@colorado.edu. Information about university policies, [reporting options](#), and support resources can be found on the [OIEC website](#).

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of any issues related to these policies regardless of when or where they occurred to ensure that individuals impacted receive information about their rights, support resources, and resolution options. To learn more about reporting and support options for a variety of concerns, visit [Don't Ignore It](#).

RELIGIOUS HOLIDAYS

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance.

See the [campus policy regarding religious observances](#) for full details.

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.

Free and unlimited telehealth is also available through [Academic Live Care](#). The Academic Live Care site also provides information about additional wellness services on campus that are available to students.