ASEN 2702 Introduction to Thermodynamics and Aerodynamics
Fall 2024

Course Syllabus

Section 001: TTh 11:30am-12:45pm Section 002: TTh 2:30pm-3:45pm

1 INSTRUCTORS

Dr Xinlin Li
Office:
Email:
Office Hours: See Canvas

Dr Melvin Rafi
Office:
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2 INSTRUCTIONAL TEAM

Teaching Facilitators:
Rashikha Jagula
Curtis Andrist
Grace Halbleib
Kirin Kawamoto
Yu Kang Kong
Decker Lazzeri
Quinn Levinson
Christopher O'Neill Jr

3 COURSE WEBSITE

Link to Canvas page:

4 TEXTBOOKS

The following textbooks are required for this course:

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.

5 COURSE DESCRIPTION

This course introduces the fundamental principles and concepts of thermodynamics and aerodynamics. Topics include the first law of thermodynamics, properties of pure substances, control volume analysis, one-dimensional incompressible and compressible flows, two-dimensional lift and drag, and introduction to viscous flows.

6 COURSE OBJECTIVES

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

Thermodynamics

- 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.

7 COURSE PREREQUISITES/COREQUISITES

Requires prereqs APPM 1360 or MATH 2300 & PHYS 1110 (all min grade C-).
Requires pre/co-req of APPM 2360 or MATH 2130 & MATH 3430 (all min grade C-).

8 CLASS POLICIES

8.1 General Policies on Syllabus and Schedule Changes

We reserve the right to make changes to the course policies stated in the Syllabus and to the Course Schedule as required throughout the semester. We will give sufficient advance notice of changes via announcements on Canvas and/or during class. The most current Syllabus and Course Schedule will be posted on the course website.

8.2 Class Format

1) This class meets in-person twice a week for a total of two hours and thirty minutes of in-class instruction.

2) In-class instruction typically consists of lectures introducing new theory and concepts, discussions, demonstration of worked examples, in-class participation activities, and other related learning experiences. These instructional modalities seek to provide students with knowledge of course material and to prepare students for completing course evaluations.

3) Course evaluations comprise of in-class participation activities, reading quizzes, homework assignments, and in-class unit exams. Students are expected to complete certain evaluations, such as reading quizzes and homework assignments, outside of scheduled lecture times.

8.3 Course Evaluations

Please see the section "Assignments & Grading" below for more information on the evaluations in this course for determining final grades.

8.4 Communication

1) **Email** – For this course, email should not be used as a primary communication method for correspondence regarding general questions about assignments, syllabus, and class policy, etc. Due to large volumes of emails received, emails sent to instructors or TFs on such topics might go unanswered. Instead, students are encouraged to use Canvas Discussions for general questions about assignments, syllabus, class policy, etc. Students should only email the instructors if they have questions or concerns regarding individual scheduling conflicts or personal issues.

2) **Canvas** – Canvas is the official webpage for this course. All general announcements, assignments, course materials, and grades will be available via Canvas. Please do not use direct messaging via Canvas messages to contact the Instructional Team.

3) **Canvas Discussions** – General questions about assignments, syllabus, class policy, and assessments should be posted on the Discussions page on Canvas.

4) **Hours of Operation** – All correspondence to instructors and TFs will be handled during regular business hours (M-F, 9am-5pm). Please do not expect immediate responses to emails or Canvas Discussions messages. Additionally, please do not expect responses to emails outside these hours or during the weekend.

5) **Additional Guidelines** – Any medical or University-related needs of absence that are known (i.e. non-emergency related) should be communicated as soon as possible. Whenever possible, any expected impact to assignments/exams should be coordinated with the instructor ***prior to missing a course deadline, not after***.

8.5 Office Hours and Student Resources

1) **Instructor Office Hours** – Please see the Canvas page for the most current Instructor office hours. Students are highly encouraged to make use of office hours to seek additional help and guidance on the course material.

2) **Teaching Facilitator Office Hours** – TF office hours for this course will primarily be held during Study Hall. To improve academic support, provide peer mentorship, and build community for undergraduate students, the Aerospace department launched the Undergraduate Study Hall program. During Study Hall, TFs will be available to provide support. For information on the latest Study Hall hours and locations, please see the course website.

8.6 Attendance

1) Attendance is expected at all scheduled lectures. Students are expected to attend all class sessions in addition to completing all assignments by the specified due dates. Some material covered in lecture may not be in the textbook. Quizzes and exams can cover any and all material disseminated in the course, including lectures and homework.

8.7 Student Expectations and Professional Behavior

1) Professional behavior and considerate communication practices are expected at all times. Any questions, comments, or concerns you may have should be respectfully voiced to your peers or the Instructional Team either in-person or via email.

2) The university expects a minimum of 300 minutes of out-of-class work per week for a 3-credit hour lecture course (approximately 75 hours total over the semester). Students will be expected to review posted material prior to lecture and to work on related assignments outside of the normal meeting times. For more information, see https://www.colorado.edu/registrar/faculty-staff/curriculum/courses/contact-hours#lecture_lec_-2101.

3) In general, we recommend that you schedule at least 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. 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.

9 ASSIGNMENTS & GRADING

The course evaluations and grade weightings for this course are as follows:

Assignment	Weight
In-Class Participation Activities	5%
Reading Quizzes	5%
Homework (Thermodynamics)	5%
Homework (Aerodynamics)	5%
Exam 1 (Thermodynamics)	20%
Exam 2 (Thermodynamics)	20%
Exam 3 (Aerodynamics)	20%
Exam 4 (Aerodynamics)	20%

9.1 Assignments

9.1.1 In-Class Participation Activities

1) There will be several unannounced in-class activities throughout the semester which will count towards participation credit. Students will work in groups during class to solve problems and will then submit their work individually via Canvas for participation credit.

2) **Policy on Missed In-Class Participation Activities** – There will be no due date extensions or make-ups for missed in-class participation activities. The lowest 2 in-class participation activity scores will be dropped. A missed in-class participation activity will count as a lowest score.

9.1.2 Reading Quizzes

1) There will be weekly reading quizzes based on the reading assignments. These reading quizzes 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 Monday evening. Students may take the quiz at any time during this 48-hour period. Once the quiz is started, students will have 10 minutes to complete the quiz.

2) **Policy on Missed Reading Quizzes** – There will be no due date extensions or make-ups for missed reading quizzes. The lowest 2 reading quiz scores will be dropped. A missed reading quiz will count as a lowest score.

9.1.3 Homework Assignments

1) There will be weekly homework assignments, which will be posted on Canvas.

2) Each homework assignment should be completed individually. The completed work should be neatly handwritten or typed and submitted via Gradescope as a PDF. It is your responsibility to check your submission before uploading it to Gradescope. Submissions that are illegible will not be graded.

3) The problems should be submitted in the same order as in the homework assignment and correctly labeled in Gradescope (pages should be assigned to each question in your Gradescope submission).

4) 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.

5) To qualify for full credit, each problem should follow the problem-solving method presented in class as follows:

    a. **Problem Statement**: Paraphrase the problem statement in your own words.
    b. **Givens/Sketch**: List and organize all the given information. Draw a sketch of the system(s) and state(s) that are being considered.
    c. **Process/Assumptions**: List any assumptions given in the problem statement.
    d. **Relevant Equations**: Write out the governing principles or equations required to solve the problem.
    e. **Properties**: Use property tables to list out required properties needed to perform analysis. Provide references for all tabulated data used.

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

6) **Policy on Missed/Late Homework** – No homework submissions will be accepted after the assignment due date/time unless extremely 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. Homework solutions are typically posted shortly after the homework due date/time.

   There is no lowest-score drop policy for homework assignments. It is your responsibility to complete all assigned homework in a timely manner and to plan for any additional time required to finalize and upload your homework submission via Gradescope. If you wait until the last minute to submit your assignment, and there is an issue with internet connectivity or with Gradescope, then you are liable for any late submissions/missed deadlines.

9.1.4 Exams

1) There will be four unit exams during the semester. The first two exams will comprehensively cover the thermodynamics topics. The last two exams will comprehensively cover the aerodynamics topics. The first three exams will be taken during regular lecture, while 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.

2) **Policy on 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 at the sole discretion of the instructor.

9.2 Late/Missed Assignments

1) All assignments and deliverables must be submitted by the specified due date and time.

2) Late submissions will not be accepted unless highly extenuating circumstances caused the student to miss the submission deadline. This will be considered on a case-by-case basis at the sole discretion of the instructor.

3) Absolutely no submissions will be accepted once solutions to the assignment have been posted.

9.3 Regrade Requests

1) Regrade requests must be made via Gradescope within 1 week of the regrade request window being opened, keeping in mind the points below. The regrade request window is usually opened within 24 hours of the graded assignment or exam being returned.

2) The purpose of a regrade request is to bring grading errors to the attention of the Instructional Team, and not to request a modification to the grading process or design of the rubric. The rubrics are final and cannot be changed or adjusted.

3) The regrade request should clearly specify the rubric item where-in the suspected grading error was made. It should also clearly explain, with direct references to the submitted work, why and where the student believes that a grading error was made. In other words, the regrade request should clearly and directly explain why the submitted work should qualify for the stated rubric item.

4) Regrade requests submitted without the required information will not be reviewed.

9.4 Final Grade Policies

Assignments are graded to an absolute standard designed to indicate your level of competency in the course material. The final grade indicates your readiness to continue to the next level in the curriculum. The AES faculty have set these standards based on our experience, interactions with industry, government laboratories, others in academe, and according to the criteria established by the ABET accreditation board.

Grades for the course are set based on the following criteria:

A, A-	Demonstrates mastery of the course material in both conceptual and quantitative aspects.
B+, B	Demonstrates comprehensive understanding of the material, with a solid conceptual grasp of key concepts and strong quantitative work.
B-, C+	Demonstrates good understanding of most key concepts, with few major quantitative errors.
C	Demonstrates satisfactory understanding of the material, with sufficient quantitative work.
C-	Demonstrates adequate understanding of the material to proceed to the next level, quantitative work with some persistent errors.
D	Little understanding is evident, consistently poor quantitative work.
F	Unsatisfactory performance.

10 CU BOULDER SYLLABUS STATEMENTS

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.

For more information, see the classroom behavior policy, the Student Code of Conduct, and the Office of Institutional Equity and Compliance.

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.

If you have a temporary illness, injury or required medical isolation for which you require adjustment, please contact your Instructor as soon as possible.

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. Understanding the course's syllabus is a vital part in 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 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 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 CUreport@colorado.edu. Information about university policies, reporting options, and support resources including confidential services can be found on the OIEC website.

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

Religious Accommodations

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. 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.