ASEN 2002
Introduction to Thermodynamics and Aerodynamics
Fall 2019

Lecture: AERO 120	**T/Th 11:30 am – 12:45 pm** *(Section 100)*
	T/Th 01:00 pm – 02:15 pm *(Section 200)*
Lab: PILOT	**M/W 8:30-10:20 am** *(Section 303)*
	M/W 10:30-12:20 am *(Section 301)*
	M/W 12:30-2:20 pm *(Section 302)*

Instructors	Prof. Jeff Thayer (Thermodynamics) Office: N407 Phone: 303-492-1764 Email: Jeffrey.Thayer@colorado.edu Office Hours: TBD	Prof. John Mah (Aerodynamics) Office: N207 Phone: 303-492-7651 Email: John.Mah@colorado.edu Office Hours: TBD
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Class Canvas Portal https://cuboulder.instructure.com/courses/54087

Texts: Cengel, Fundamentals of Thermal-Fluid Sciences, 5th Edition.
Anderson, Introduction to Flight, 8th Ed. 2016 (hardcopy or electronic version)

Prerequisites: APPM 1360, CHEM 1211/1221, PHYS 1110 or equivalent, GEEN 1300 or equivalent
Corequisite: APPM 2350 or equivalent, ASEN 2001

Required Equipment: safety glasses/goggles and clickers, Students can register their clickers to their 9 digit student ID here: http://www.colorado.edu/oit/tutorial/cuclickers-iclicker-remote-registration. Laboratory notebooks are expected for tracking assignments and documenting lab progress, and may be spot checked periodically (note

that lab notebooks will be required for Sr. Projects, as well as good professional practice, so use this opportunity to establish a good habit).

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

Topical Outline:

1. Basic concepts of thermodynamics
2. Conservation of energy: the First Law of Thermodynamics
3. Properties of pure substances
4. Control Volume Analysis
5. Introduction to basic concepts of aerodynamics
6. One-dimensional incompressible flows
7. One-dimensional compressible flows
8. Two-dimensional flows: lift and drag
9. Introduction to viscous flows

Grading

Evaluated Outcomes

The Department of Aerospace Engineering Sciences has adopted a policy of assigning grades according to "evaluated outcomes" in each course:

O1 Professional context and expectations (ethics, economics, business environment, etc.)
O2 Current and historical perspective
O3 Multidisciplinary, systems perspective
O4 Written, oral, graphical communication ability
O5 Knowledge of key scientific/engineering concepts
O6 Ability to define and conduct experiments, use instrumentation
O7 Ability to learn independently, find information
O8 Ability to work in teams
O9 Ability to design
O10 Ability to formulate and solve problems
O11 Ability to use and program computers

Evaluation of these outcomes allows an assessment of your performance and provides a major portion of the process we use for continuous assessment and improvement of the entire AES undergraduate curriculum. The model for these outcomes derives from several sources including the "*Desired Attributes of an Engineer*" as defined by The Boeing Company, and "curriculum reviews" from major aerospace corporations including The Boeing Co., Lockheed Martin Corp. and Ball Aerospace Corp. These inputs were combined with the AES faculty vision of the desired attributes of an aerospace engineer and the requirements of the Accreditation Board for Engineering and Technology (ABET) to produce this list of evaluated outcomes. Each assignment designed and graded to assess some combination of these outcomes.

Grade Breakdown: The two principal lecture and lab sections of the course, *thermodynamics and aerodynamics*, are equally weighted. Your final grade is determined according to the following percentage breakdown.

Type	Description	Percentage
Individual	Quizzes	10%
	4x Exams	50%
	Thermo Exam 1	*10%*
	Thermo Exam 2	*15%*
	Aero Exam 1	*10%*
	Aero Exam 2	*15%*
Group	Homework*	10%
	Experimental Labs**	20% (1 thermo, 2 aero)
	Design Lab**	10% (1 thermo)
Total		**100%**

** Although homework must be submitted individually, it can be discussed, therefore, counts as a 'group' grade.*
*** Lab & Design reports and/or presentation scores may be adjusted by instructors for individuals based on team peer evaluations.*

Grading Philosophy: Assignments and evaluations are graded to an absolute standard designed to assess your level of competency in the course material. Minor adjustments may be made in the determination of final letter grades and with grade cut lines, but there is no "curving" in this course. The final grade indicates your readiness to continue to the next level in the curriculum, which requires a C or better to meet AES pre-req standards. The faculty have set these standards and expectations based on our education, experience, interactions with industry, government laboratories, others in academe, and according to criteria established by the ABET accreditation board.

IMPORTANT: The course grade is primarily dependent on individual measures of competency, i.e. exams and quizzes. The other course assignments are designed to enrich the learning experience and to enhance individual performance, not to substitute for sub-standard individual competency. Accordingly, group assignment grades (labs and homework) are only incorporated into the final grade when the individual grade (made up of quizzes and exams) is a C or better. In other words, if your individual score average is below a C, then the group-based grade fraction will not be averaged in to your final grade, which will now be based solely on your individual score. This policy makes it important to use the group assignments as opportunities to enhance your own learning and not simply rely on your team members to 'divide and conquer'. If the work in the assignment is split up among group members, be sure that the learning is not also split up, but is shared among the whole group (i.e., everyone is accountable for and knowledgeable of all parts of their team's collective product).

Class Policies: Students are all responsible for knowing and adhering to the following class policies

1. Emails will be responded to during business hours, i.e. Monday through Friday, 8:00 am – 5:00 pm. Emails regarding exams or lab reports which are received 24 hours or less before the exam or lab report deadlines may not receive a response. Students are encouraged to attend office hours in lieu of emails as it enables clarity and learning.
2. Homework assignments are due per due date & time stated on the Canvas course site. Quiz questions for a grade may be given at any point during any class, so be sure to attend regularly and arrive on

time with a functioning clicker! If you must miss class for an excused absence, you may submit your homework early. Late homework submittals are not accepted.

3. In the case of homework, laboratory reports, presentations, or exam conflicts, you must make arrangements with the professor at least two weeks in advance. There are no unexcused make-up assignments or exams without official documentation for the absence (e.g., doctor's note, jury duty, etc.)

4. A homework assignment may have several problems and although only a few randomly selected questions will be graded for each set, your grade will reflect completion of all assigned parts. Solutions, however, will be provided to you for all the problems.

5. Group collaboration is permitted on homework, but efforts are individual. This means you may discuss the means and methods for solving problems and even compare answers, but you are not free to copy someone's work or the solutions manual. The homework you submit must be your own. *Keep in mind that solving problems yourself reinforces learning the material.*

6. Collaboration on quizzes or exams, using another student's work as your own, or allowing another student to use your work as their own, is considered academic misconduct and will not be tolerated. If you are caught in any of these activities, you may receive a grade of "F" for the course and a report will be made to the Office of Student Conduct & Conflict Resolution.

7. All assignments will be submitted electronically (unless otherwise stated) via the Canvas course site. All homework must be <u>handwritten</u> and either scanned or utilize a digital writing software (OneNote, Apple Notes, etc). Work must be neat and readable with adequate spacing and margins. You are responsible for legibility - no reevaluation will be granted for illegible submissions. You are responsible for ensuring your digital upload contains all your work and properly uploads to the Canvas site. *Always check your uploaded assignment turn-ins! Noncompliant or unacceptably illegible submittals will be returned ungraded with a score of zero.*

8. Your name (last, first), assignment number, and due date should be visible in the upper portion of each page. Final answers must be indicated with an arrow or box, or underlined. Multiple answers (when only one is required) will be counted as incorrect.

9. Experimental lab reports should be completed using digital word processing program (Word, LaTex, PDF, etc). All group member names with relevant assignment information must appear on the cover page. Bottom line - submit all work with a professional appearance. *Neatness, clarity, and completeness really do count in the work world!*

10. Detailed guidelines for laboratory reports and presentations will be distributed and reviewed separately. Labs are written up and presented in groups, and initially graded as a group effort. Final individual grades for each lab assignment, however, will reflect an anonymous peer evaluation of the group members and professor assessment. The peer assessment is a multiplying factor that can significantly alter your individual grade relative to the group grade. This is done to promote fairness in assigning group grades where individual contributions to the group's work may be unequal, but also to promote equal contribution from all group members.

11. Assignment and Exam Regrade Policy: If you would like to submit a regrade request for any assignments or exams you must email the regrade request to all instructors (Prof Thayer, Prof Mah, and Prof Hodgkinson) within *2 weeks of the graded assignment return date*.
    - The regrade request must include a pdf of your graded exam, along with a paragraph in the email stating the problem number, grading issue, and what you believe the correct grade should be.
    - Points can be added OR removed based on correctness. Therefore, if a mistake was made in grading and too few points were awarded, the regrade request may increase the final score, however 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.

- For every exam, a random sampling of exams will be scanned and saved. *DO NOT ALTER YOUR EXAM IN ANY WAY IF YOU PLAN ON SUBMITTING FOR REGRADE.*

12. Always have a clicker and a calculator in the lectures. If you forget to bring your clicker to class (or your battery dies), you will be allowed to submit your answers on paper for one quiz only. A score of zero will be assigned for subsequent quizzes for a forgotten or inoperable clicker.

13. Use of MATLAB is required unless otherwise stated for labs.

14. Attendance at all scheduled lecture/discussion and laboratory periods is expected. Some of the material covered in class is not in the textbook. This policy does not apply for any exams or quiz days. There will be no unexcused exam makeups provided. If you miss an exam, course instructors will evaluate each case on an individual basis based on the context and information available to make a determination if a makeup exam will be provided. Students are encouraged to provide as much documentation as possible to enable an informed decision.

15. If you have three or more final exams scheduled on the same day, you are entitled to arrange an alternative exam time for the last exam or exams scheduled on that day. To qualify for rescheduling final exam times, you must provide evidence that you have three or more exams on the same day, and arrangements must be made with your instructor no later than the end of the sixth week of the semester

16. Any other medical or studies-related needs of absence that are known (non-emergency) should be communicated and approved ahead of the date of occurrence.

17. Expect new material to be presented in both the lecture/discussion and laboratory periods. Quizzes and exams can cover all material in the course including lectures, homework and laboratory work.

18. Rationale for course assignments and evaluations:
    - Assigned reading assignments are to be completed before the start of the lecture period. Accompanying your reading assignment will be questions to help guide your reading and prepare you for graded quiz questions given during lecture. The lecture discussions can include graded quiz questions to help evaluate grasp of key concepts. The lectures will help clarify and supplement your reading and to prepare you for the homework assignments and exams.
    - Homework reinforces the mental processes that help you to become proficient in a subject. In addition to the assigned homework, we encourage you to work additional problems for practice and make summary notes for yourself. Before beginning any homework assignment, you should read the relevant text sections and work through the examples in the text.
    - Experimental laboratory exercises are more complex than the homework and require special equipment (such as the wind tunnel). You will work in teams to collect and analyze the data, as well as write up the experimental laboratory report.
    - Exams and quizzes provide a gauge to determine what you have learned individually.
    - Design projects help you to learn how to synthesize the basic concepts, methods, and tools presented in the course curriculum by combining theory and practice. The team-oriented lab approach will give you experience in the benefits and challenges of working and cooperating in groups, as is typical in this industry.

19. ***Safety is priority #1 in the PILOT laboratory***. Anyone violating rules of safe conduct may receive a zero for the laboratory exercise and may be restricted from the PILOT. Use of PILOT facilities is a privilege, not a right, and you must conduct yourself according to the PILOT rules and regulations. Those endangering themselves, others, or laboratory equipment by their unsafe conduct will not maintain their access privileges. Failure to wear appropriate safety gear will result in a 10% grade penalty for the lab.

20. Use of electronics in the classroom aside from taking notes is strongly discouraged.

21. 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 professor either in person or via email.

ACCOMMODATION FOR DISABILITIES

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 or injury, see Temporary Medical Conditions under the Students tab on the Disability Services website.

CLASSROOM BEHAVIOR

Students and faculty each have responsibility for maintaining an appropriate learning environment. 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. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the Student Code of Conduct.

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 policy may include: plagiarism, 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 the Honor Code (honor@colorado.edu; 303-492-5550). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found at the Honor Code Office website.

SEXUAL MISCONDUCT, DISCRIMINATION, HARASSMENT AND/OR RELATED RETALIATION

The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct intimate partner abuse (including dating or domestic violence), stalking, protected-class discrimination or harassment by members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website.
Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

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.