

ASEN 2002
Introduction to Thermodynamics and Aerodynamics
Fall 2017

Lecture Time/Location: Section 010 (All) – Tuesday/Thursday 3:30-4:45pm MATH 100

Laboratory Time/Location: Section 011 – Wednesday 8-9:50am ITLL 2B10

Section 012 – Wednesday 10-11:50am ITLL 2B10

Section 013 – Wednesday 1-2:50pm ITLL 2B10

Section 014 – Wednesday 3-4:50pm ITLL 2B10

Instructors:

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Laboratory Coordinator:

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Overflow Lab Period: T/Th 12:30-2:00pm

Teaching Assistants:

Daniel Bateman	Alfredo Cruz	Arvind Dudi	Joel (Gabe) Funtanilla
Office: ECAE 124	Office: ECAE 124	Office: ECAE 124	Office: ECAE 124
Hours: F 10-11:30am	Hours: M 10-11:30am	Hours: M 3-4:30pm	Hours: F 1-2:30pm
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Class Assistants:

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Lab Assistants:

Lara Lufkin	Andy Kain
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Class Web Site: <https://learn.colorado.edu/>

Required Texts: McGraw Hill Connect: Cengel, *Fundamentals of Thermal-Fluid Sciences*, 5th Edition.
Anderson, *Introduction to Flight*, 8th edition.

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, bound lab notebook, i.e. the pages are NOT removable, numbered pages are optional

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

We do not grade on a “curve”. Our grading scheme is not assigned to reward or punish. It is designed to indicate your level of competency compared to the standards set by the AES faculty. Do you meet the minimum level of competency? Do you exceed the minimum? Are you below the minimum? This should be indicated by the final grade. We (the faculty) are professionals and it is our job to set and maintain standards. We are expected to use our education, experience, and interactions with industry, government laboratories, others in academe, etc., to determine the content of these standards. Because our program is accredited by ABET (Accreditation Board for Engineering and Technology), the AES curriculum meets or exceeds that board’s standards. As with any other professionals (doctors, lawyers, etc.) you must trust that we know what we are doing and that we are obliged to uphold standards.

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 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, i.e., you show some level of proficiency.

ASEN 2002 is designed to take advantage of the facilities of the ITLL to enrich your learning experience. We will provide a high-quality learning experience and we will uphold the academic standards determined by the AES faculty.

Grade Breakdown According to Assignments: Your final grade is determined according to the following percentage breakdown:

Individual Effort:

Unit Quizzes	10%
4 Exams:	50%
Exam 1 – Thermodynamics Exam 1 – 10%	
Exam 2 – Thermodynamics Exam 2 – 15%	
Exam 3 – Aerodynamics Exam 1 – 10%	
Exam 4 – Aerodynamics Exam2 – 15%	

Group Effort:*

Homework	10%
Experimental Laboratories	20%
Design Laboratories	10%
	<hr/>
	100%

*** Group effort only counts toward final grade if total individual grade is C or better**

Important Notes and some Q&A:

1. We reserve the right to reply to email questions only in business hours, i.e. Monday through Friday, 8:00 am – 5:00 pm. Emails received 24 hours or less before the exams are not guaranteed a response. To better help us manage and track your emails, from the junk and clutter that we receive on a daily basis, please include **ASEN2002** at the beginning of the subject line.

2. It is in your best interest to regularly check your grades once posted to D2L. Grade disputes must be resolved within two weeks of posting to D2L. This will avoid undue complications at the end of the semester when final grades are being determined.
3. We reserve the right to make changes to the weekly course schedule based on occurring events that require different dispositions. We will give sufficient advance notice through announcements in class and posting on the web. Changes to this syllabus and assignments-table may be announced at any time during class periods. We will post the current syllabus and assignments-table on the web. Both are dated in the footnote.
4. Always have a calculator for both lecture/discussion and laboratory sessions. Access to the current online textbook may prove useful but should not be done if it leads to your or your neighbor's distraction.
5. **Attendance** to all scheduled lecture/discussion and laboratory periods is expected. In addition to announced unit quizzes, random unit quizzes may be given during any lecture/discussion or laboratory session. Like the scheduled quizzes and exams, *there are no make-ups*. We may normalize quiz grades at the end of the semester (not guaranteed).
6. Expect new material to be presented in both the lecture/discussion and laboratory periods. Quizzes and exams cover all material in the course including lecture/discussions, homework, and experimental and design laboratory work.
7. Why have reading assignments, homework, lab exercises, exams, and design projects?
 - **Reading assignments** are to be completed *before* the lecture/discussion. The lecture/discussions should help to clarify and supplement what you have read.
 - **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. Before beginning any homework assignment, you should read the text and work the examples in the text. Homework, which is graded in the category of "group work", may be discussed with the TAs and fellow students. Copying is not acceptable and the HW must be a representation of your own understanding of the material.
 - **Experimental laboratory exercises** are either more complex than hands-on homework or require special equipment (such as a wind tunnel). You will work in teams but may be required to submit individual experimental laboratory reports.
 - **Design projects** help you to learn how to synthesize the basic concepts, methods, and tools presented in the course curriculum. The team-oriented approach will give you experience in working and cooperating in groups. A portion (up to 20%) of the total design lab grade will be from anonymous peer evaluation by team members.
8. **Exams and quizzes** provide a gauge to determine independently what *you* have learned. Exams will be administered during lecture time and the allotted final exam period. Tentative dates for the exams are Sept 26, Oct 17, Nov 14 and Dec 20. The exams are cumulative within each of the topic areas of thermodynamics and aerodynamics and are weighted to reflect this. Specifically exams 1 and 3 are weighted at 10% and exams 2 and 4 are weighted at 15% of the overall grade.
9. **Guidelines** for Experimental and Design Labs will be handed out at the time they are assigned. Each lab assignment will include a grading rubric for you to use in preparation of your reports.
10. **Lab reports** must be submitted electronically to the appropriate dropbox on D2L. The report **must be**, in pdf format. Group reports should have all group member names on the cover page.
11. **Acceptable excuses**, such as medical certification of an emergency, are required to make up any unit exam (however there will be no make-up opportunity for quizzes). Any other medical or studies-related needs of absence have to be communicated and approved ahead of the date of occurrence.

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 (Friday, October 5, 2017).

12. **Homework assignments are due at the start of class on the due date.** There is a five-minute grace period during which the homework may be submitted. If you arrive after the grace period, you must state your reason for tardiness to your classmates. They will then vote, by show of hands, to determine if the instructors shall accept your work. If the nay votes are the majority, the assignment will be assigned a grade of zero. If you must miss class for an excused absence, you may submit your homework early. *Late assignments are not accepted*—that includes assignments slipped under the professors' doors after class has started. However, if you will not be attending class you may submit your homework early. If you know in advance that you must miss a homework due date or lab, send your instructor an e-mail or voice mail to make arrangements. *There are no make-up quizzes or exams. Be on time!*

All homework must be completed on 8.5×11-inch engineering paper. Do not submit assignments on spiral notebook paper with ripped edges. Multiple pages must be stapled in the upper-left corner, no paperclips or dog-ears. **Solve each**

problem on its own page and do not use the back of the page – this will help the TAs distribute and grade your HW. Your name (last, first), assignment number, and due date should be visible on the outside in the upper portion of **each page**. Written work must be neat and readable with adequate spacing and margins. You are responsible for legibility—no reevaluation will be granted. Very messy work will be returned to you ungraded and a score of zero recorded. Final answers must be indicated with an arrow, underline, or box. Multiple answers (when only one is required) will be counted incorrect.

Always submit work with a professional appearance. Neatness, clarity, and completeness count.

Each homework assignment will include a set of several problems, which you are expected to completely solve using the Engineering Problem Solving Approach. Your assignment will be partially graded for completeness (10pts), while two randomly selected problems will be graded in detail for accuracy (10pts each, 20pts total). Thus the final score for each homework set will be out of a total of 30pts and computed based upon the numeric breakdown below:

$$HW \frac{Score}{30} = 10pts (Rand. P1) + 10pts (Rand. P2) + 10pts \times \frac{\# \text{ of Remaining Problems Completed}}{\# \text{ of Remaining Problems in Set}}$$

Solutions will be provided to you for all the problems when the graded homework sets are returned.

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'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. 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. ***Every student is expected to turn in their own individual assignment for grading!***

13. **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 academic misconduct and is not tolerated.** If you are caught in any of these activities, you will receive a grade of "F" for the course and a report will be submitted to the Dean's office and the University Honor Board for further punitive action.

We suggest you read the statement of the Honor Code Office at <http://honorcode.colorado.edu/about-honor-code>.

14. This class is not graded on a "curve"; there are absolute expectations of performance. A performance of 90% will earn an A, 80% earns a B, etc. However, we reserve the right to normalize the class grades based on the expected minimum level of competency. Furthermore, to receive a course grade of C or better (which is required to fulfill the prerequisite for ASEN2003/4 and other courses), students must receive a C or better in the individual coursework portion of the class.
15. **Safety is priority #1 for the experimental laboratory.** You are required to attend the safety lecture presented by the ASEN 2002 Laboratory Coordinator during the first week of the semester. The ITLL also has a mandatory orientation. Anyone violating rules of safe conduct may receive a zero for the laboratory exercise and may be restricted from ITLL. Use of ITLL facilities is a privilege, not a right, and you must conduct yourself according to the ITLL rules and regulations. Those endangering themselves, others, or laboratory equipment by their unsafe conduct will not maintain their access privileges.
16. Food and drink are not allowed in the ITLL laboratory plazas. This includes bottled water.
17. Some assignments require access to a computer, basic programming skills, and familiarity with some programming languages and/or environments similar to what is covered in introductory computing courses. The minimum requirement is some proficiency with MATLAB; i.e. you should be able to complete tasks like those described in the MATLAB tutorial. If you are not familiar with MATLAB, it is your responsibility to become so. You have access to the ITLL Lab Plaza computers during regular class lab times or during periods for which no other class is using them. There are also a number of computers in the student group-study rooms and in the main building of the Engineering Center.
18. All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to [the academic integrity policy](#). Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code Council (honor@colorado.edu; 303-735-2273). Students who are found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code Council as well as academic sanctions from the faculty member. Additional information regarding the academic integrity policy can be found at the [Honor Code Office website](#).
19. 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. In this class, you should make arrangements with the instructors at least two weeks in advance if there is a religious observance conflict with exams, quizzes, homework, and laboratory reports. See the [campus policy regarding religious observances](#) for full details.

20. The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127. Information about the OIEC, the above referenced policies, and the campus resources available to assist individuals regarding sexual misconduct, discrimination, harassment or related retaliation can be found at the [OIEC website](#).
21. 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 \(www.colorado.edu/disabilityservices/students\)](#). 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 and discuss your needs with your professor.
22. 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](#).

Evaluated Outcomes

This is one of the first courses in the ASEN curriculum where you will begin to acquire the following skills and abilities, which are the expected outcomes from our program at graduation:

- O1** Professional context and expectations (ethics, economics, business environment, etc.)
- O2** Current and historical perspective of aerospace engineering
- 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 (the Faculty) 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.