ASEN 2004
Introduction to Aerospace Vehicle Design and Performance
Spring 2018

Lecture: DUANE G1B30	**T/Th 8:00 am-9:15 am** *(Section 010)*
Lab: ITLL 2B10	**M/W 8:00-9:40 am** *(Section 011)*
	M/W 10:00-11:40 am *(Section 012)*
	M/W 1:00-2:40 pm *(Section 015)*

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Class Web Portal D2L site: https://learn.colorado.edu/

Texts: Anderson, **Introduction to Flight**, 8th Ed. 2016 (hardcopy or electronic version)
Sellers, **Understanding Space: An Introduction to Astronautics**, 3rd Ed. 2005

Prerequisites: ASEN 2001, 2002, 2012 and APPM 2350.

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 Objectives: To introduce the theory and methods for design and performance analysis of aircraft and spacecraft. Aircraft topics include wing design, propulsion, aircraft performance, and stability and control. Spacecraft topics include mission design, rocket performance, orbital mechanics and spacecraft subsystems. Emphasis is placed on introducing systems engineering aspects of design and analysis for aerospace vehicles.

Topical Outline

Aircraft

1. Elements of airplane design
2. Performance of airfoils and wings
3. Airplane propulsion
4. Elements of airplane performance
5. Preliminary airplane stability and control

Spacecraft

1. Elements of space mission design
2. Launch requirements and rocket performance
3. Introduction to astrodynamics
4. Overview of spacecraft subsystems
5. Introduction to spacecraft systems engineering

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, *Aero* and *Space*, are equally weighted. Your final grade is determined according to the following percentage breakdown.

Type	**Description**	**Percentage**
Individual	Quizzes	10%
	Exams (2 aero & 2 space)	40% (10% for each exam)
Group	Homework*	10%
	Lab Reports	20% (1 aero, 1 space)
	Lab Presentations	20% (1 aero, 1 space)
Total		**100%**

** Although homework must be submitted individually, it can be discussed, therefore, counts as a 'group' grade.*

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, but there is a limited amount of "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).

Important Notes and Class Policies:

1. *Homework assignments are due at the start of class on the due date and quizzes may be given at any point during any class, so be sure to attend regularly and arrive on time!* If you must miss class for an excused absence, you may submit your homework early. **Late homework submittals are not accepted** - this includes homework slipped under the professor's door after class has started. However, if you will not be attending class, you may submit your homework *prior to class* by slipping it under the instructor's door.
2. In the case of homework, laboratory report, presentation, 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.)**
3. 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.
4. **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.*
5. **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.**
6. **All assignments must be submitted on 8.5"x11" paper with no ripped spiral bound edges.** You may use both sides of ruled notebook paper. However, use only the front side of engineering paper (the front is the side without the grid). All written work must be neat and readable with adequate spacing and margins. You are responsible for legibility - no reevaluation will be granted for illegible submissions. Multiple pages must be stapled in the upper-left comer, no paperclips or 'dog-ears'. **Non-compliant or unacceptably illegible submittals will be returned ungraded with a score of zero.**
7. 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.

8. Experimental lab reports should be completed using software such as Microsoft Word. Group reports should not be folded and 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!*

9. 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.

10. Always have a clicker and a calculator in the lectures.

11. Use of MATLAB is required.

12. **Attendance at all scheduled lecture/discussion and laboratory periods is expected** unless an excused absence is approved in advance. Some of the material covered in class is not in the textbook. Unit quizzes may be assigned in advance of a lecture and given again in the lecture to reinforce material retention. Like the exams, there are no unexcused make-ups for missed quizzes, however, the **lowest quiz will be dropped** before the final class grade is calculated. For quizzes given in advance and then repeated in class, your final score for that quiz will be the average of those 2 scores.

13. 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.

14. 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.**

15. Rationale for course assignments and evaluations:

    - Assigned reading assignments and any pre-quizzes are to be completed *before* the start of the lecture period. The lecture discussions are used to help clarify and supplement what you have read and been quizzed on 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 and rocket static test stand infrastructure). 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.

16. ***Safety is priority #1 in the experimental laboratory.*** The ITLL has a mandatory orientation. If you did not go through the orientation during the fall semester ASEN 2001/2 courses, you must do so ASAP. 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. Failure to wear appropriate safety gear will result in a 10% grade penalty for the lab.

17. Food and drink are not allowed in the ITLL laboratory plazas. This includes bottled water. There are water fountains in the hall.

18. Use of electronics in the classroom aside from taking notes is strongly discouraged. If you desire to view any animated images, please sit in the back of the room so as to not distract those students who are in the line of sight behind you.

19. The classroom in Duane Physics has an upper and lower section. Sitting in the balcony is not allowed.

20. 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 to your professor a letter from Disability Services in a timely manner (for exam accommodations provide your letter at least one week prior to the exam) so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact Disability Services at 303-492-8671 or by e-mail at dsinfo@colorado.edu. If you have a temporary medical condition or injury, see guidelines for Temporary Medical Conditions under the Quick Links at the Disability Services website and discuss your needs with your professor.

Religious Observances

Campus policy regarding religious observances states that faculty must 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.

Classroom Behavior

Students and faculty each have responsibility for maintaining an appropriate learning environment*, not only while in class, but also while working outside of class such as in labs and study areas.* 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 differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. 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.

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

The University of Colorado Boulder (CU-Boulder) is committed to maintaining a positive learning, working, and living environment. CU-Boulder will not tolerate, *both in-class and outside of class*, 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.

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Academic Integrity Policy of the institution. Violations of the policy may include: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access, clicker fraud, resubmission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Office of Student Conduct & Conflict Resolution. Students who are found responsible of 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 academic integrity policy can be found at Student Honor Code Policy.