

ASEN 2004
Introduction to Aerospace Vehicle Design and Performance
Spring 2019

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 013)

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Class Web Portal Canvas Site:

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/W0 GpMflesET792 reW* nBT/hg2.22 1.22 1.22 1.22 1.22 1.22 40.3ETQS92 rBT/F2 10.0

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. Elements of airplane performance
4. Preliminary airplane stability and control
5. Preliminary airplane propulsion

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

- 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

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.

17. **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.
18. For the Aero Glider Design Lab, students are expected to contribute **no more than \$5 each** towards the construction of their glider. Value may be less depending on availability of lab-provided materials and individual design requirements.
19. Food and drink are not allowed in the ITLL laboratory plazas. This includes bottled water. There are water fountains in the hall.
20. 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.
21. The classroom in Duane Physics has an upper and lower section. Sitting in the balcony is not allowed.
22. 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

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 (including sexual assault, exploitation, harassment, dating or domestic violence, and stalking), discrimination, and 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. In this class, {Faculty: insert your procedures here}. See the campus policy regarding religious observances for full details.