

## ASEN 2004 – Spring 2021

### Introduction to Aerospace Vehicle Design and Performance

**Recitation:** Tu/Th 8:30 – 9:45 am  
**Lab:** M/W 8:30 – 10:20 am (Section 011)  
Email: [aaronwj@colorado.edu](mailto:aaronwj@colorado.edu)

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**Class Website:** <https://canvas.colorado.edu/courses/69951>

**Slack:**

**Quiz / Lab Submission Site:** Gradescope, <https://www.gradescope.com/courses/221063>

**Class Email List:** Through Canvas.

**Texts:** Anderson, **Introduction to Flight**, 8<sup>th</sup> ed. 2016 (hardcopy or electronic version)  
Sellers, **Understanding Space: An Introduction to Astronautics**, 3<sup>rd</sup> (2005) or 4<sup>th</sup> (2014) ed. (only select chapters required: 1, 4, 5, 6, 7, 12, 13, and 14.)

**Prerequisites:** ASEN 2002, ASEN 2012, APPM 2350 or equivalent.

**Corequisites:** APPM 2360 or equivalent.

**Required Equipment**

A way to turn written work into a PDF. This could be a tablet computer on which you write electronically, or a scanner smartphone app (such as CamScanner or Scannable) to scan in handwritten work on paper.

A computer microphone or a phone would be very beneficial to participate in group work.

**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.

**Major Course Topics**

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 Guidelines**

Group work:	2 Aircraft Labs	20% (10% each)
	2 Spacecraft Labs	20% (10% each)
Individual:	6 Quizzes (3 aircraft, 3 spacecraft)	60% (10% each)
		100%

Group work only counts towards final grade if the total individual grade is C or better.

Please verify all your scores and grades on Canvas and Gradescope within 2 weeks after they are posted; requests to change a score need to be made within this period. All regrade requests should be submitted to Gradescope using the “regrade request” functionality.

We reserve the right to make minor changes to this distribution of weights based on variations in assignments.

## Course Delivery

Guidelines use the following definitions:

In-Person (Synchronous): activity in person on campus on scheduled days and times.

Hybrid (Synchronous): rotating in-person schedule.

Remote (Synchronous): activity via Zoom or other real-time platform on scheduled days and times; students will need to participate in activity or complete assignment at a specified time.

Online (Asynchronous): activity via lecture capture or Canvas online; students can participate when it is convenient for them within a specified time window.

Class	Class Delivery	Notes
Lecture	Online (Asynchronous)	Online videos posted to Canvas every Friday for the following week's 1-2 topics. Recommend watching the day of or before the scheduled topic.
Recitation	Remote (Synchronous)	Offered over Zoom during lecture times. Attendance is encouraged, but not required with a few exceptions noted on the schedule. Recitations will be recorded and posted to Canvas after they occur synchronously.
Quizzes	Remote (Synchronous)	Quizzes occur during scheduled lecture time and will be submitted via Gradescope. Attendance is required.
Final Exam (Optional)	Remote (Synchronous)	The final exam will occur during the university-scheduled time and will be submitted via Gradescope. Attendance is required.
Office Hours	Remote (Synchronous)	Offered over Zoom.
Lab	Remote (Synchronous)	Offered over Zoom and will occur during scheduled lab time. Attendance is required on Mondays and encouraged, but not required, on Wednesdays with a few exceptions noted on the schedule. You also need to work with your assigned lab team outside of lab hours to complete assignments.

Testing (Optional)

Hybrid (Synchronous)

During the last 2 weeks of labs, teams will have the opportunity to build their glider and rocket and sign up eno2 (r)5 (i a a)4 (t)4 (dul67.88 265.2 41.4 reW-2 (

## **Online Learning Protocol**

The Zoom meeting environment is a professional one—



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 “

” 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.

### **Important Notes:**

1. All questions regarding course content (material, homework, quizzes, lab assignments) should be posted to the course Slack workspace or asked over Zoom during lab, recitation, or office hours. Slack posts regarding quizzes or lab assignments that are received 24 hours or less before the deadlines will not be responded to. All other questions, concerns, or issues not regarding course content should be e-mailed to the instructor. E-mails and Slack posts will be responded to during business hours, i.e. Monday through Friday, 8:00 am – 5:00 pm MST/MDT.
2. All homework questions must be posted to the course Slack workspace. If we receive an email with a homework question, we will direct you to the course Slack workspace board.
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. Canvas will be used to send out announcements, to provide comments to you daily on class activities, and to provide general information about course assignments.
5. Rationale for course assignments and evaluations
  - Reading assignments are to be completed before viewing the lecture video. The lectures will help clarify and supplement your reading and to prepare you for homework assignments, quizzes, laboratory work, 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 static test stand). You will work in teams to collect and analyze the data, as well as deliver the experimental laboratory assessment.
  - 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

6. Homework:

All homework questions must be submitted to the

be defined prior to the lab introduction and will attempt to account for an individual's situation such as time-zone differences or access to high-speed



## **Requirements for COVID-19**

As a matter of public health and safety due to the pandemic, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements, and public health orders in place to reduce the risk of spreading infectious disease. Required safety measures at CU Boulder relevant to the classroom setting include:

- maintain 6-foot distancing when possible,
- wear a face covering in public indoor spaces and outdoors while on campus consistent with state and county health orders,
- clean local work area,
- practice hand hygiene,
- follow public health orders, and
- if sick and you live off campus, do not come onto campus (unless instructed by a CU Healthcare professional), or if you live on-campus, please alert [CU Boulder Medical Services](#).

Students who fail to adhere to these requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to [Student Conduct and Conflict Resolution](#). For more information, see the policies on [COVID-19 Health and Safety](#) and [classroom behavior](#) and the [Student Code of Conduct](#). If you require accommodation because a

## Honor Code



