

ASEN 3300: Getting Started Checklist (before Monday!)

- Make sure you are registered for the class on Canvas
- Make sure you are registered for the class on Gradescope
- Join the class Slack workspace:
[REDACTED]
[REDACTED]
- Find two classmates and form a group
- Read the Syllabus (this document)
- Complete the *Electronics Hardware Kit Agreement and Honor Code Contract* on Canvas
- Read Lab 1 Assignment
- Complete Lab 1 prelab on Gradescope
- Come to the first day of lecture (Monday, January 13)
- Come to the first day of Lab (Monday, January 13)
 - Complete the PILOT Tour (on Canvas) → Computer access
 - Lab kit / locker combination

NOTE:

- Prelab 1: due Wed, 01/15, 11:45 am. Complete on Gradescope
- Quiz 1: due Thursday, 01/16, 5 pm. Complete on Canvas
- Lab 1: due Friday, 01/17, 6 pm. Submit to Gradescope

Syllabus for ASEN 3300: Aerospace Electronics and Communications

Spring 2025

Revised: 01/09/2025

Weekly schedule

Lecture: AERO 120, Monday and Wednesday, **11:45 am – 12:35 pm** (section 010)

Lab: AERO 141, Monday and Wednesday, **12:50 – 2:40 pm** (011) or **2:55 – 4:45 pm** (012)

Instructors

Professor Robert Marshall

Office: AERO

Phone:

e-mail: robert.marshall@colorado.edu

Professor Scott Palo

Office: AERO

Phone:

e-mail: scott.palo@colorado.edu

Teaching and Lab Assistants

TFs/LAs and their office hours are posted on Canvas.

Lab Coordinator

Trudy Schwartz

Office: AERO

Phone:

e-mail: trudy.schwartz@colorado.edu

Note that Professor Schwartz will have limited availability in Spring 2025.

Class Web Portal

- Canvas site at: <https://canvas.colorado.edu>
- Slack workspace: join here:

Required Texts and Equipment

- ASEN 3300 Lab Kit: Provided to each group and stored in PILOT; to be returned at the end of the semester. Students are responsible for replacement of items broken or not returned.
- **Textbook:** Scherz and Monk, *Practical Electronics for Inventors*, 4th edition; ISBN-10: 1259587541. Available online here:
<https://www.accessengineeringlibrary.com/content/book/9781259587542?implicit-login=true>

Suggested Reference Texts

- Horowitz and Hill, *The Art of Electronics*, 3rd edition; ISBN-10: 0521809266
- Wolfson, *Essential University Physics, Volume 2*, 3rd edition; ISBN-10: 0321976428
- Makarov, Ludwig and Bitar, *Practical Electrical Engineering*, Springer, 2016; ISBN 978-3-319-21173-2 (available as an eBook)

Course Overview

Modern aerospace vehicles rely on electronics, computers, and communications as essential system components. While these systems are most often designed by Electrical Engineers, to be effective as system designers, integrators, and analysts, Aerospace Engineers must have a solid understanding of these critical subsystem areas. The aim of this course is to provide an overview of analog electronics, digital electronics, and communication system concepts as they are used in the aerospace industry. **The emphasis is on practical, hands-on experience and important concepts in a select number of key areas.** Throughout the course, students work in teams to design, build, test, and analyze electronic circuits, work with electronic instruments, interface these instruments to a computer, and design a communications link. It is our goal that students walk away from this class with a basic understanding of instrumentation electronics, computer interfacing, and radio communications. This understanding is derived from experience building and working with real electronics in the lab.

Course Outline

The course is divided into three main sections: i) analog electronics, ii) digital electronics, and iii) communications. A number of the lab experiments in all three sections are designed to utilize the Analog Devices ADXL321 or 326 accelerometer.

1. In the Analog Electronics section of the course, we look at the accelerometer output to study vibrations of a beam. In the process, we build passive circuits to lower the output range of the accelerometer and active circuits to amplify it, conditioning circuits to filter noise in the output, and learn to use multimeters, oscilloscopes, and spectrum analyzers.
2. In the second section of the course on Digital Electronics, you will learn about relevant topics such as communications protocols, analog-to-digital and digital-to-analog conversions, sampling, aliasing, combinatorial and sequential logic circuits.
3. In the final section of the course on Communications, we learn how to modulate carrier signals, compute a satellite communications link budget, and design and conduct a GPS receiver experiment.

Prerequisites

Physics II, Aerospace Mathematics, and Introduction to Dynamics and Systems are prerequisites for this course. In fact, much of the material covered in this class you have been exposed to already in these earlier courses. We expect you to build upon this experience and make connections between the new material and the old. In ASEN 2001-2004 you have seen and used instrumentation electronics, but in general, someone else took care of designing them. In Physics II you covered some circuit theory, but did not build any practical systems. For this course it is assumed that you have a working knowledge of the prerequisite material. We will build on this foundation by revisiting these topics in more detail and conducting hands-on laboratory experiments.

Class Format

The semester is organized into 12 weekly laboratory modules, with other weeks reserved for exams. With the exception of the first two labs, each lab module lasts one week beginning with the Monday lecture session.

- The Monday lecture introduces the concepts and materials to be studied in the lab, and provides an overview of the reading materials and the lab activities, including a pre-lab homework assignment. The prelab, conducted on Gradescope, is due before Wednesday's lecture time.
- The following Monday lab session begins group lab work on the week's assignment. Instructors and teaching assistants are available in the lab to answer questions, demonstrate how to use

- equipment, and discuss the material with individual lab groups.
- The second lecture period on Wednesday is used to finish the topic of the ongoing lab and teaching assistants will be in lab to answer questions about the experiments.
- The weekly quiz will be available to students starting at 5 pm on Wednesday. Students will take the quiz before 5 pm on Thursday.
- Wednesday's lab section continues the group work in the lab with emphasis on documentation of methods and analysis of results for inclusion in the lab report.
- Group lab reports are due on Friday at 6 pm**, and will be submitted **online via Gradescope** (as a PDF) for grading. Please review the Lab Guidelines handout for more information. We will try to grade the group lab reports within one week.

Assessment / Written and Practical Exams

Assessment of individual student knowledge and ability is conducted **using written and practical examinations**. For the schedule of the exams please see the class schedule. Written and practical exams will take place **in-person** and synchronously. The practical exam involves demonstrating knowledge and skills such as proper use of equipment, how to set up a circuit, and how to perform measurements.

Course Grading

The final grade is a combination of individual and group work.

Type	Description	Percentage
Individual Work (IW) (75% total)	Quizzes (best 11 out of 12)	5%
	Exam #1 (midterm)	15%
	Exam #2 (midterm)	15%
	Practical Exam	10%
	Final Exam	25%
	Faculty, TA, and Peer Evaluation	5%
Group Work (GW)	Lab Reports (12)	20%
	Pre-lab assignments	5%
Final Grade (FG)	If $IW > 70\%$ $FG = 0.75 \cdot IW + 0.25 \cdot GW$ else $FG = IW$	

Take note of the last line above: If your individual work grade is less than 70%, then the group work will not be included in your final grade, and your final grade will be given by your **individual work only**. Otherwise, individual work accounts for 75% of your final grade, and group work accounts for the other 25% of your final grade.

Faculty, TF, and Peer Evaluation: 5% of your final grade will be based on feedback from the faculty, TA

and your lab partners. This grade will be anchored to your individual work grade and will be adjusted up or down based on feedback. Items that can increase your grade include active participation in your lab group, participation in online discussions (Slack), participation in class and office hours. The best way to increase this grade component is to demonstrate engagement in the course and be a good lab partner. This element can have an impact if you are on a grade boundary and is determined at the discretion of the course faculty.

Regrade requests: Requests for grade changes are the responsibility of the student. If you feel that a prelab, quiz, lab report, or exam has been graded incorrectly, bring your concerns to the instructor or one of the TFs. Regrade requests will be accepted up to one week after grades have been posted for an assignment.

Rationale for course assignments:

- Prelabs reinforce the mental processes that help you to become proficient in a subject. The prelab quizzes largely serve as your homework assignments in this class. We also encourage you to work additional problems for practice. Before beginning any assignment, you should read the text and work the examples in the text.
- Experimental laboratory exercises are either more complex than hands-on homework or require special equipment. You will work in pairs 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.
- Lab experiments help you to learn how to synthesize the basic concepts, methods, and tools presented in the course curriculum. The team-oriented lab approach will give you experience in working and cooperating in groups as is typical in industry.

Assignment Submission and Late Policy

1. Prelabs:
 - a. Submitted as a Gradescope "quiz". Multiple tries are allowed and you can work with your lab partners. Prelab Gradescope submission opens at 6 pm on Friday along with the lab assignment and closes at 11:45 am on Wednesday (i.e. before lecture) regardless of lab section.
 - b. Prelabs will **not** be accepted after 11:45 am on Wednesday.
2. Quizzes
 - a. Quizzes are conducted on Canvas and available from Wednesday at 5 pm until Thursday at 5pm. You will have 15 minutes to complete the quiz once you start it. Only a single try is allowed.
 - b. Quizzes are a closed book, closed notes individual assignment.
 - c. Once you have take the quiz you may not discuss it with anyone until after 5pm on Thursday.
 - d. No makeup quizzes will be provided as quiz solutions are provided shortly after Thursday at 5 pm.
 - e. Your quiz grade will take the best 11 out of 12 quizzes; this policy is designed to accommodate missed quizzes.
3. Lab reports:
 - a. Due at 6 pm each Friday.
 - b. 10 point deduction for each day late.
 - c. An assignment submitted at 6:01pm is considered one-day late, so don't wait to submit.
 - d. Late penalties will not be assessed until Monday at 6:01pm
 - e. Labs will not be accepted after 6 pm the following Friday (one week after the due date).

Exams

This course has four (4) scheduled exams. This includes two evening exams scheduled for Wednesday

February 19 and Wednesday March 19 from 5:30 to 7:00 pm in AERO 120. A lab practical exam is scheduled for Wednesday April 9 during lab, and the final exam is scheduled for Sunday May 4 from 7:30-10:00 pm in AERO 120. **All exams are in person and mandatory.** If you have a valid reason that you will miss one of these exams, please contact the faculty immediately to discuss alternative options. Should you miss an exam for any reason, you must contact the faculty within 24 hours otherwise you will receive a zero (0) for your exam grade.

Exam and Assignment Regrading

Regrading requests for any assignment must be submitted within 1 week after the assignment has been returned. All regrading requests must be coherent and show a clear understanding of the problem. Generic requests for more points will not be considered.

Communications

- All questions regarding course content (lecture material, prelabs, quizzes, exams, lab assignments) should be posted to the course **Slack workspace** or asked during lab, lecture, or office hours.
- Please post questions about lab, prelab, and quizzes in the relevant Slack channel. Use the #general channel for course logistics questions.
- We encourage you to use the #random channel for fun (but appropriate) posts that are peripherally related to the course.
- If we receive an email with a prelab or lab question, we will direct you to post on the course Slack workspace and relevant channel.
- The teaching team will make every effort to respond to course related Slack posts in a timely manner (typically within 1 business day).
- If questions are posted 24 hours or less before an assignment deadline, we cannot guarantee a response before the deadline.
- Any question, concern, or issue not regarding course content or of a personal nature should be e-mailed to a course instructor.
- **Any emails sent to a member of the teaching team should include ASEN3300: in the subject line.**
- We cannot guarantee that emails and Slack posts will receive a response outside of regular business hours, i.e. Monday through Friday, 8:00 am – 5:00 pm MST/MDT.
- **We strongly encourage you, the students, to answer each other's questions in Slack.** This is a great way to work together to solve problems, and not have to wait for an instructor or TA response.
- We reserve the right to make changes to the weekly course schedule based on unexpected events that may come up during the semester. We will give sufficient advance notice through announcements in class and posting on Slack. Changes to this syllabus may be announced at any time during class periods, and an updated syllabus document will be posted on Canvas.

Cheating

Cheating will not be tolerated, and the CU Honor Code will be upheld.

As group work is part of this class (lab experiments and report), it is useful to clarify what is considered cheating. You are expected to perform the lab assignments as a group and divide the workload equally. Communication within the group is encouraged. It is OK to discuss the assignments and reports with fellow students in the class as long as this is done with the intention of learning, i.e., understanding the material. Sharing results or data analyses is permitted only under specific circumstances, when there is no way for you to retake the data or redo the analysis. For example, if you realize after finishing your lab

work that your data are erroneous, you may use and analyze the data from a different group. However, in this case, you need prior faculty approval and provide a full disclosure and explanation why data sharing was necessary, and give proper credit to the source. Using answers from prior semesters is not allowed and considered an honor code violations.

When in doubt about what is considered unethical, you should always exercise caution and ask the instructor(s) if they have any questions or concerns that what they are doing may be a violation of the honor code.

Weekly Schedule (labs 3-12)

Topic	Day	Time	Type	Submission
Prelab due	Submission opens on Friday along with lab assignment and closes on Wednesday	11:45 am	Individual submission	Gradescope
Weekly Quiz due (15 minutes)	Submission opens on Wednesday and closes on Thursday	5 pm	Individual	Canvas
Lab Due	Friday	6 pm	Group	Gradescope

Some Logistics

1. Students are assigned to a team of 3 persons for the duration of the semester.
2. Teams work together to study the lab; design, implement, test, and analyze their circuits; and write the lab reports. Students are encouraged to collaborate in preparing for quizzes, discussing lab questions and results.
3. Weekly quizzes and all exams are to be completed individually. Any type of collaboration or copying constitutes cheating and will result in a zero grade for all parties involved and will be reported. A repeated instance of cheating will be reported on the student's permanent record and will result in an F for the course. Please see also Honor Code web pages at <http://www.colorado.edu/academics/honorcode/>.
4. Weekly quizzes will be conducted via Canvas starting on Wednesday 5 pm and closing on Thursday, 5 pm. Students will have 15 minutes to complete the quiz once started.
5. The purpose of the prelab assignment (submitted individually) is to prepare you for the weekly lab. It is important to complete the prelab before the first lab session; otherwise you will have difficulty completing the lab in the allotted lab time. Answers to prelab questions will be entered into Gradescope. Prelab submission opens on Friday at 6 pm and closes on Wednesday at 11:45 am.
6. Lab exercises are conducted together with your team and a single lab report is submitted at the end of the week via Canvas. Collaborations with other groups including shared diagrams or extensive discussion of results must be acknowledged in your report. Copying text or answers from another group with or without their permission constitutes cheating and will result in a zero grade for the weekly lab module. A repeated instance of cheating will be reported on the student's permanent record and will result in an F for the course. Please see the Honor Code web pages at <http://www.colorado.edu/academics/honorcode/>.
7. University closure: If an assignment is due and the University is closed due to weather or other circumstance, then the assignment will be due on the next day that the University is open. In the event that a lab or lecture is cancelled due to a University closure, please check the website and Canvas announcements for updated information. All critical communications will be conveyed through Canvas announcements.
8. Please check your schedules as soon as possible to determine if you expect to miss class on any

of these days for religious or other reasons. If there is a conflict, it is the student's responsibility to notify the instructors as soon as possible to make alternate arrangements. Copying, collaborating, or discussing material in a written or oral exam during the exam period constitutes cheating and will result in an F for the course, and will be reported on the student's permanent record.

University Policies – Spring 2025

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 Honor Code may include but are not limited to: plagiarism (including use of paper writing services or technology [such as essay bots]), 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. Understanding the course's syllabus is a vital part in adhering to the Honor Code.

All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution: StudentConduct@colorado.edu. Students found responsible for violating the [Honor Code](#) will be assigned resolution outcomes from the Student Conduct & Conflict Resolution as well as be subject to academic sanctions from the faculty member. Visit the [Honor Code](#) site for more information on the academic integrity policy.

Accommodation for Disabilities, Temporary Medical Conditions, and Medical Isolation:

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. **Students should expect to receive accommodations for a timed assessment (e.g., exam) only if their faculty instructor(s) receive the student's accommodations letter at least 5 business days before the assessment, as a departmental policy, in order to facilitate administering the assessment.** 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, see [Temporary Medical Conditions](#) on the Disability Services website.

If you have a temporary medical condition or required medical isolation for which you require accommodation, please notify the instructor as soon as possible so that appropriate accommodations can be made.

If you are sick or require isolation please notify the instructor of your absence from in-person activities and continue in a completely remote mode, as you are able, until you are allowed or able to return to campus.

Please note that for health privacy reasons you are not required to disclose to the instructor the nature of your illness or condition, however you are welcome to share information you feel necessary to protect the health and safety of others within the course.

Accommodation for Religious Obligations:

Campus policy requires faculty to provide reasonable accommodations for students who, because of

religious obligations, have conflicts with scheduled exams, assignments or required attendance. Please communicate the need for a religious accommodation in a timely manner. In this class, you must let the instructor know of any such conflicts within the first two weeks of the semester so that they can work with you to make reasonable arrangements.

See the [campus policy regarding religious observances](#) for full details.

Preferred Student Names and Pronouns:

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Classroom Behavior:

Students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote, or online. Failure 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, marital status, political affiliation, or political philosophy.

For more information, see the [classroom behavior policy](#), the [Student Code of Conduct](#), and the [Office of Institutional Equity and Compliance](#).

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

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits protected-class discrimination and harassment, sexual misconduct (harassment, exploitation, and assault), intimate partner abuse (dating or domestic violence), stalking, and related retaliation by or against members of our community on- and off-campus. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who have been subjected to misconduct can contact OIEC at 303-492-2127 or email CUREport@colorado.edu. Information about university policies, [reporting options](#), and OIEC support resources including confidential services can be found on the [OIEC website](#).

Please know that faculty and graduate instructors are required to inform OIEC when they are made aware of incidents related to these concerns regardless of when or where something occurred. This is to ensure that individuals impacted receive outreach from OIEC about their options and support resources. To learn more about reporting and support for a variety of concerns, visit the [Don't Ignore It page](#).

Mental Health and Wellness:

The University of Colorado Boulder is committed to the well-being of all students. If you are struggling with personal stressors, mental health or substance use concerns that are impacting academic or daily life, please contact [Counseling and Psychiatric Services \(CAPS\)](#) located in C4C or call (303) 492-2277, available 24/7.

Free and unlimited telehealth is also available through [Academic Live Care](#). The Academic Live Care site also provides information about additional wellness services on campus that are available to students.

