

ASEN 3300: Getting Started Checklist

- Register for the class on Canvas AND Gradescope
- Join the class Slack workspace, see canvas for details
- Form lab groups and fill out by the end of Tuesday, 1/17
 - Option 1: Individual - you will be teamed with 2 others
 - Option 2: Due - you have two names, 3rd student will be added, but may be split up to complete all groups
 - Option 3: Provide a full group with three names
 - NOTE: students in one group **MUST** be in the same section
- Read the Syllabus (this document)
- Complete the *Electronics Hardware Kit Agreement and Honor Code Contract* on Canvas
- Read Lab 1 Assignment (before the lab sessions on Jan 18th)
- Complete Lab 1 Prelab/Quiz by 6 pm on Friday Jan 20th
- Come to the first day of lecture/lab (Wednesday, 1/18)
- Complete the PILOT Tour (on Canvas) → Computer access
- Lab 1: due Friday, 1/20, 6 pm. Submit to Gradescope

Syllabus for ASEN 3300: Aerospace Electronics and Communications

Spring 2023

Revised: 1/19/2023

Weekly schedule

Lecture/Recitation: AERO 120, Monday and Wednesday, **11:45 - 12:35 pm**

Lab: AERO 141, Monday and Wednesday, **12:50 – 2:40 pm** or **2:55 am – 4:45 pm**

Instructors

Professor Dennis Akos

Office: AERO 452

Phone:

e-mail: dma@colorado.edu

Office hours: see weekly schedule

Professor Zoltan Sternovsky

Office: AERO 347

Phone:

e-mail: Zoltan.Sternovsky@colorado.edu

Office hours: see weekly schedule

Teaching Assistants

TAs and their office hours are posted on Canvas.

Teaching and Lab Assistants

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

Lab Coordinator

Trudy Schwartz

Office: AERO 150B

Phone:

e-mail: trudy.schwartz@colorado.edu

Class Web Portal

- Canvas site at: <https://canvas.colorado.edu>
- Slack workspace: join from link posted on canvas (Slack is the primary communication portal for this class)

Required Texts and Equipment

- Laboratory Notebook
- 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 implement 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, we log data from the accelerometer instrument to the lab station computers and discuss relevant issues such as communications protocols, analog-to-digital and digital-to-analog conversions, and sampling.
3. In the final section of the course on Communications, we will use the accelerometer data as a source of telemetry; modulate carrier signals, compute satellite communications link budgets, 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 base 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 week, each lab module lasts one week and consists of two lectures and two lab sessions. The first 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 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 is used to finish the topic of the ongoing lab and teaching assistants will be present in the second lab period to answer questions about the experiments.

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) (65% of total)	Exam #1 (midterm)	15%
	Exam #2 (midterm)	15%
	Practical Exam	15%
	Final Exam	15%
	Faculty, TA, and Peer Evaluation	5%
Group Work (GW) (35% of total)	Lab Reports (12)	20%
	Pre-lab assignments	10%
	Quizzes (best 11 out of 12)	5%
Final Grade (FG)	If $IW > 70\%$ $FG = 0.65 \cdot IW + 0.35 \cdot GW$ 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 65% of your final grade, and group work accounts for the other 35% of your final grade.

Faculty, TA, and Peer Evaluation: 5% of your final grade will be based on feedback from the faculty, TA and your lab partners. The most important element of this grade component is **being a good lab partner** (i.e., showing up on time, active participation in the lab, doing the fair share of the measurements and writing the lab report). Further considerations include active participation in class, online discussions (Slack), and office hours.

Rationale for course assignments:

- Homework reinforces 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 groups 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. The practical exam gauges the hands-on skills you picked up using the test
- 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.

Weekly Schedule, Assignment Submission and Late Policy

See the posted weekly schedule on Canvas for **posting dates and due dates**.

1. Prelabs
 - a. Submitted individually as a Canvas “quiz”. Multiple tries are allowed.
 - b. The Prelab is posted along with the lab assignment and must be submitted by the time/date defined in the weekly schedule.
 - c. Late submissions will not be accepted, as Prelabs are designed to help you to prepare for labs. (The first week is an exception.)
2. Quizzes
 - a. Quizzes are submitted individually on Canvas. The weekly schedule provides the due date and time of submission.
 - b. You will have 15 minutes to complete the quiz once you start it. Only a single try is allowed.
 - c. No makeup quizzes will be provided as the solutions are posted shortly after the submission deadline. Your quiz grade will take the best 11 out of 12 quizzes; this policy is designed to accommodate missed quizzes.
3. Lab reports:
 - a. Submitted through Gradescope, with the deadline is defined in the weekly schedule.
 - b. 10% deduction for each day late. An assignment submitted one minute after the deadline is considered one-day late, so don't wait to submit.
 - c. Labs will not be accepted 168 hours (one week) after the deadline.

Exam and Assignment Regrading

Regrading requests for any assignment must be submitted through gradescope within **one week after grades have been posted** for that assignment. 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 channel for that lab. 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).
- Questions posted 24 hours or less before an assignment deadline may not receive 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 to provide a full disclosure and explanation why data sharing was necessary, and give proper credit to the source. You may also want to notify the instructor(s) and/or the TFs.

Getting help with the lab work and reports from outside the class is generally not permitted. This includes help from senior students or using lab reports from previous years.

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.

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. Each individual student can decide how to organize their own notes, but results should be clearly

transcribed into the final lab document.

4. 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/>.
5. Weekly quizzes are to be completed individually. The purpose of the quizzes is providing timely feedback on understanding the material.
6. The purpose of the prelab assignment (completed 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.
7. 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/>.
8. 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 canceled due to a University closure, please check the website and Canvas announcements for updated information. All critical communications will be conveyed through Canvas announcements.
9. 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. Make up exams due to illness require a note from a physician. 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 2023

Classroom Behavior

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. 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. For more information, see the [classroom behavior](#) policy, the [Student Code of Conduct](#), and the [Office of Institutional Equity and Compliance](#).

Requirements for COVID-19

As a matter of public health and safety, all members of the CU Boulder community and all

visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the MyCUHealth portal.

The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking 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 policy on classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). {Faculty: insert your procedure here for students to alert you about absence due to illness or quarantine. Because of FERPA student privacy laws, do not require students to state the nature of their illness when alerting you. Do not require "doctor's notes" for classes missed due to illness; campus health services no longer provide "doctor's notes" or appointment verifications.}

Accommodation for Disabilities

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](#). 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.

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.

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, 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 Student Conduct & Conflict Resolution (honor@colorado.edu); 303-492-5550). 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. Additional information regarding the Honor Code academic integrity policy can be found on the [Honor Code website](#).

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 sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, protected-class discrimination and harassment, and related retaliation by or against members of our community on- and off-campus. These behaviors harm individuals and our community. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who believe they have been subjected to misconduct can contact OIEC at 303-492-2127 or email cureport@colorado.edu. Information about university policies, [reporting options](#), and support resources can be found on the [OIEC website](#).

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of any issues related to these policies regardless of when or where they occurred to ensure that individuals impacted receive information about their rights, support resources, and resolution options. To learn more about reporting and support options for a variety of concerns, visit [Don't Ignore It](#).

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