ASEN 2012: Experimental and Computational Methods in Aerospace Engineering Sciences

University of Colorado **Boulder**

Fall Semester 2024, Last edited on: September 5, 2024

Syllabus

Time: Section 001: MW 10:40 AM - 11:30 PM
Section 002: MW 3:00 PM - 3:50 PM

Classroom: AERO 120

Instructor: Professor Jeff Glusman (he|him)
Office Location: AERO N205
Office Phone:
Email:

Teaching Facilitator: Ryan Caputo (he|him)

Zoë Flynn (she|her)

Skylar Harris (she|her)

Ivy Hill (she|her)

Sawyer Kuvin (he|him)

Derek Merlet (he|him)

Kelsey Mitchell (she|her)

Alex Virga (he|him)

Description: This course provides an introduction to statistical, experimental and computational methods used in aerospace engineering sciences.

Learning Goals: A student who successfully completes this course will:

1. Have an understanding of professional context and expectations (ethics, economics, etc.),
2. Be capable of written, oral and graphical communication,
3. Be capable of learning and finding information independently,
4. Be capable of formulating and solving engineering problems, and
5. Be capable of using and programming computers.

The course will also reinforce students' understanding of fundamental concepts covered in ASEN 1320 (Aerospace Computing and Engineering Applications).

Prerequisites: Requires prereq courses ASEN 1320 or CSCI 1300 or CHEN 1310 or ECEN 1310 and PHYS 1110 (all minimum grade C-). Requires prereq or coreq course APPM 2360 or MATH 2130 & MATH 3430 (min grade C-). Restricted to UG ASEN and IDEN mjrs with Aerospace emphasis.

Required Text: Taylor, John R. "An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements", 1996, 2nd edition, University Science Books, ISBN-13: 978-0935702750 (A 3rd edition exists, but is not much different)

Supplemental References: Pratap, Rudra: "Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers", 2010, Oxford University Press, ISBN-13: 978-0199731244

Merrin, Jack: "Introduction to Error Analysis: The Science of Measurements, Uncertainties, and Data Analysis", 2017, CreateSpace Independent Publishing Platform, ISBN-13: 978-1975906658

Matlab On-Ramp and Fundamental courses (https://matlabacademy.mathworks.com/)

Class Format: The class meets in-person twice a week for fifty minutes of active classroom instruction. Note that the activities vary day by day with some class periods focused on formal lecture or project introductions, while others may be focused on carrying out coding challenges, carrying out simulations or writing laboratory reports and completing other deliverables. Note the specific calendar weeks are identified below in the "Schedule of Activities".

Class Deliverables: All of the projects will be carried out in small groups, assigned by the instructional team, which will be sized appropriately to match the amount of work expected.

To complete these assignments, students must have access to a computer, basic programming skills, and familiarity with some programming languages and/or environments similar to what is covered in introductory computing courses. The minimum requirement is some exposure to MATLAB. If you are not familiar with MATLAB, it is your responsibility to become more acquainted. In addition to turning in a report or video presentation for each project, students will be required to submit their post-processing or analysis code. When requested your code

should be must be submitted in a single zip file, including a "driver" or "main" MATLAB script producing all requested figures. Code for group projects may be written as a group, but each individual within the group is responsible for understanding exactly how all of the code works. Reports and code should be submitted to the appropriate Canvas assignments by the due date, no late assignments will be accepted. It is your responsibility for confirming the intended files were uploaded and run properly.

Further guidelines for each activity will be addressed in the respective assignment documents.

Honor Code Policy: You are responsible for all work submitted in this course. This means that you should be able to quickly and effectively communicate the meaning of every line of code or text in your submission. Trial and error is *not* a sufficient response to how something was written. It is permissible to discuss coding strategies with classmates, however, it would be highly inappropriate for code structures to be alike. The use of generative AI is highly discouraged: ultimately, what you turn in must be your own work, and easily explainable. All reports and code will be ran through a similarity checker. Copying material from any resource (including code from another student or online) and submitting it as one's own is considered plagiarism and is an Honor Code violation. Students who are found in violation once will receive a zero grade for the assignment and will be reported for an "Honor Code Violation" for additional non-academic actions. Students who are found in violation after the previous issue will receive an "F" for the class and will be reported for an "Honor Code Violation" for additional non-academic actions.

Attendance Policy: Attendance is expected at all scheduled class periods, and students should expect new material to be presented. None of the lectures will be recorded or posted for asynchronous consumption. Thus students who miss important information during class periods should coordinate with their peers and catch-up independently on the material they may have missed.

Course Website and Course Communications: There will be a class website on Canvas. All relevant documents, assignments, schedules, and supplemental documents will be posted to this site throughout the semester. Please check back to see what has been posted. All course announcements outside of the class periods will be sent as Canvas announcements, so it is the student's responsibility to make sure their Canvas settings are appropriately configured to receive these announcements.

Students should e-mail the course instructor and/or teaching facilitators if they have a pressing logistical or health issue. Always include ASEN2012 in the subject line, in addition to a complete subject line. The teaching team will aim to respond to e-mails within one business day. All questions related to assignments and course content should be asked in office hours, at the consolidated Aerospace Study Hall periods or via Piazza (through Canvas).

Professor Office Hours: The following times and locations will be staffed by the professor:
Tuesday:
By appointment,

TF Office Hours: The following times and locations will be staffed by a teaching facilitator:

Monday: (Ivy)
Tuesday: (Kelsey, Zoë)
Wednesday: (Ivy), (Alex, Ryan)
Thursday: (Ryan), (Kelsey, Alex)
Friday: (Zoë), (Sawyer, Skylar)

Derek will be in AERO 210 (BOLD Center) for walk-in tutoring:

Schedule of Activities: The following presents a nominal schedule for the semester:

Week	Date	Monday Activity/Due	Wednesday Activity/Due
1	Aug. 26	Introductions & Matlab Review	LS1 Matlab, Flowcharting & Debugging
2	Sep. 2	**Labor Day (no class)**	LS2* Tech. Writing & Time Mgmt. **Syllabus/Matlab Quiz Due Su**
3	Sep. 9	LS3* Statistics and Error	LS3* Statistics and Error
4	Sep. 16	**Coding Challenge 1 Due W**	LS4* Error Propagation
5	Sep. 23	LS4 Error Propagation	LS5 Monte Carlo
6	Sep. 30	**Coding Challenge 2 Due W**	Project 1 Kick-off
7	Oct. 7	LS6* Linear Least Squares	LS6 Linear Least Squares
8	Oct. 14	**Coding Challenge 3 Due W** **Project 1 Part 1 Due M**	LS7* Numerical Integration
9	Oct. 21	LS7 Numerical Integration	**Coding Challenge 4 Due F**
10	Oct. 28	LS8 Engineering Ethics	Project 2 Kick-off **Project 1 Due Sun**
11	Nov. 4	LS9 ode45 in Matlab	**Coding Challenge 5 Due F**
12	Nov. 11	LS10* ode45 systems of equations	**Coding Challenge 6 Due F**
13	Nov. 18	LS11 Tech. Pres.	LS12 Experimental Design **Project 2 Part 1 Due Sun**
14	Nov. 25	**Fall Break (no class)**	**Fall Break (no class)**
15	Dec. 2	**Ethics Debate**	Generalized Coding
16	Dec. 9	Project 2 Work Day	Project 2 Work Day **Project 2 Due Th**

All assignments are due by 11:59 pm on the day listed.
Lectures with the $*$ symbol mark a flipped lecture is to be watched *before* lecture (open 3 days prior to complete).

Grading: The following presents the planned grading structure for the course. Be aware, that this

is subject to change, however the class will be thoroughly notified and polled for agreement.

50% 2 Projects
40% 6 Coding Challenges
10% Class Participation and Flipped Lectures
- Grades are posted to the class website (Canvas).
- There will **not** be a final exam for this course.

Remarks on Grading: Our grading scheme is not designed to reward or punish. It is designed to indicate your level of competency compared to the standard that we set. Do you meet the minimum level of competency? Do you exceed the minimum? Are you below the minimum? The answers to these questions should be indicated by your final grade.

The final grade indicates your readiness to continue to the next level of courses. Meeting the minimum requirements indicates that you are prepared to continue at least at the minimum level required for the next in the sequence of courses. Exceeding the minimum means you are ready to enter the next course and that you have mastery of material beyond the minimum, that is, you show some level of proficiency.

Regrading: All regrade requests must be made within two weeks of receiving the grade for an assignment. These requests must be made via email to the appropriate course teaching facilitator **and** course instructor copied. Regrade requests received verbally or without the instructor copied will **not** be considered.

Letter Grading Scheme: Course grade determinations are absolute and requests for makeup work, submissions of late assignments, or other general exceptions will not be considered. Letter grades will be assigned as follows:

Letter Grade	Percent Grade	4.00 Scale
A	93.00 - 100.00	4.00
A-	90.00 - 92.99	3.67
B+	87.00 - 89.99	3.33
B	83.00 - 86.99	3.00
B-	80.00 - 82.99	2.67
C+	77.00 - 79.99	2.33
C	73.00 - 76.99	2.00
C-	70.00 - 72.99	1.67
D	60.00 - 69.99	1.00
F	Below 60.00	0.00

CU Syllabus Statements:

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, 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 Infectious Diseases: Members of the CU Boulder community and visitors to campus must follow university, department, and building health and safety requirements and all public health orders to reduce the risk of spreading infectious diseases.

The CU Boulder campus is currently mask optional. However, if masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class. Students who do not leave class when asked or who refuse to comply with these requirements will be referred to Student Conduct & Conflict Resolution. Students who require accommodation because a disability prevents them from fulfilling safety measures related to infectious disease will be asked to follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

For those who feel ill and think you might have COVID-19 or if you have tested positive for COVID-19, please stay home and follow the further guidance of the Public Health Office. For those who have been in close contact with someone who has COVID-19 but do not have any symptoms and have not tested positive for COVID-19, you do not need to stay home.

Accommodation for Disabilities, Temporary Medical Conditions, and Medical Isolation: Disability Services determines accommodations based on documented disabilities in the academic environment. If you qualify for accommodations because of a disability, submit your accommodation letter from Disability Services to your faculty member in a timely manner so your needs can be addressed. Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance.

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. Also 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 (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.

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. Visit Honor Code for more information on the academic integrity policy.

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.

Visit OIEC for or more information about university policies, reporting options, and support resources. If you believe you may have been subjected to misconduct, email OIEC or call 303-492-2127.

Faculty and graduate instructors are required to inform OIEC when they learn of any issues related to these policies regardless of when or where they occurred. This ensures that individuals impacted receive information about their rights, support resources, and resolution options. Visit the Don't Ignore It page to learn more about reporting and support options.

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, 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.

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, 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.

CU Community of Care Syllabus Statement: CU Boulder is committed to a community of care in which students are supported by faculty and staff throughout their college journey. You don't have to face academic challenges alone – CU and the college are here to help you learn and succeed in your coursework and campus life. Part of this community of care is

your connection to faculty and staff across campus. Our college promotes and hopes you will connect with faculty or staff who may reach out during your educational journey at CU.

Course Alerts Syllabus Statement: This course participates in the CU Course Alert process to help connect you with support resources and identify your barriers to success (colorado.edu/engineering-advising/coursealerts). If you receive a course alert for this class, please plan todo any one, or more of the following: schedule a meeting with me, attend office hours, connect with a TF of the course.