ASEN 2012: Experimental and Computational Methods in Aerospace Engineering Sciences

University of Colorado **Boulder**

Spring Semester 2025, Last edited on: January 12, 2025

Syllabus

Time: Section 001: T Th 1:25pm-2:15pm

Classroom: AERO 111

Instructor: Professor Jeff Glusman (he|him)
Office Location: AERO N205
Office Phone: (303)735-0523
Email: Jeff.Glusman@colorado.edu

Teaching Facilitators: Ivy Hill (she|her)
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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 (or 3rd edition)

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, group coding activities, working on group reports, or completing other deliverables. Note the specific calendar weeks are identified below in the "Schedule of Activities".

Class Deliverables: All 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. All other assignments are expected to be carried out as an individual.

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. MATLAB scripts should run to completion **without** the use of any external packages/toolboxes (e.g., Symbolic Math, Statistics and Machine Learning). Code for any 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**. You may submit as many times as you wish; the *last* on-time submission will be graded. 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. It is permissible to discuss coding strategies with classmates, however, it would be highly inappropriate for code structures or algorithms to be alike. 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, loss all Professionalism points (15% of your overall grade), 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. Depending on the severity of the violation, different and/or additional repercussions may occur (including, but not limited to, loss of a letter grade, automatic failure for first offense, etc.) Additional information can be found in the CU Honor Code.

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 instructors and teaching assistants/facilitators only 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:
TBD
By appointment

TF Office Hours: The following times and locations will be staffed by a teaching facilitator or BOLD Center Tutor:
TBD

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

Week	Date	Tuesday Activity/Due	Thursday Activity/Due
1	Jan. 13	Introductions & Matlab Review	LS1 Matlab, Flowcharting & Debugging
2	Jan. 20	LS2* Tech. Writing & Time Mgmt.	LS3* Statistics and Error **Syllabus/Matlab Quiz Due Su**
3	Jan. 27	**In-Class Coding 1 Due F**	LS3* Statistics and Error
4	Feb. 3	LS4 Error Propagation	LS4* Error Propagation
5	Feb. 10	LS5 Monte Carlo	LS6 Engineering Ethics
6	Feb. 17	**Coding Challenge 1 Due F**	Project 1 Kick-off
7	Feb. 24	LS7* Linear Least Squares	LS7 Linear Least Squares
8	Mar. 3	**In-Class Coding 2 Due F**	LS8* Numerical Integration **Project 1 Part 1 Due Su**
9	Mar. 10	LS8 Numerical Integration	LS9 Tech. Pres.
10	Mar. 17	**Coding Challenge 2 Due F**	Project 2 Kick-off **Project 1 Due Su**
11	Mar. 24	**Spring Break (no class)**	**Spring Break (no class)**
12	Mar. 31	LS10 ode45 in Matlab	LS10 ode45 in Matlab
13	Apr. 7	**In-Class Coding 3 Due F**	LS11* ode45 systems of equations
14	Apr. 14	**Coding Challenge 3 Due F**	LS12 Experimental Design **Project 2 Part 1 Due Su**
15	Apr. 21	**Ethics Debate**	Generalized Coding
16	Apr. 28	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 7 days prior).

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.

25% Project 1
25% Project 2
20% 3 Coding Challenges
15% Professionalism
15% Class Participation, In-Class Coding Activities, 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.

Professionalism: Students are required to act professionally towards their TA/TFs, AES staff and faculty, and fellow students. Students are required to utilize building spaces and resources correctly and respectfully. Failure treat fellow human beings professionally, or incorrectly utilize building spaces or resources will result in a reduction to the Professionalism grade. Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Additionally, students are required to act ethically and abide by the CU Student Code of Conduct and the CU Honor Code. Those who fail to adhere to such standards may be subject to a loss in points relative to the nature of the infraction.

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 assistant/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

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 Honor Code 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 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, 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.