ASEN 1320: Aerospace Computing and Engineering Applications

Material is preliminary and subject to change

Lecture: M/W/F 09:05 AM – 09:55 AM, ECCS 201

Instructor	Professor Khosro Ghobadi-Far Email: Khosro.ghobadifar@colorado.edu ***O***ffice: AERO
Teaching Assistant	Prateek Behera
Teaching Facilitators	• Santiago Huertas *Office Hours*: • Sofia Ibarra *Office Hours*: • Avvie Chubyuk *Office Hours*: • Adarsh Boddeda *Office Hours*: • Roselyn Marquina *Office Hours*: • Vladimir Castanon *Office Hours*:

Recitations	**Section**	**Time**	**Room**	**Recitation Lead**
	011	(W) 10:10 AM – 11:00 AM	ECCR 143	Sofia Ibarra
	012	(W) 11:15 AM – 12:05 PM	ECCR 143	Santiago Huertas
	013	(W) 12:20 PM – 01:10 PM	ECCR 143	Santiago Huertas
	014	(TH) 02:00 PM – 02:50 PM	ECCR 143	Roselyn Marquina
	015	(TH) 03:05 PM – 03:55 PM	ECCR 143	Avvie Chubyuk
	016	(W) 04:30 PM – 05:20 PM	**AERO N100**	Adarsh Boddeda
	017	(W) 01:25 PM – 2:15 PM	ECCR 143	Vladimir Castanon

Web Site: Canvas (https://canvas.colorado.edu)
Q&A: Piazza[1]
IDE: MATLAB[2] and AWS Cloud9[3]

[1] Piazza is used for class-wide Q&A and discussion, and can be accessed via Canvas.
[2] MATLAB license is available for CU students at no cost from https://oit.colorado.edu/.
[3] AWS Cloud9 Integrated Development Environment used for C++ can be accessed via course website.

Course Objectives

Most aerospace engineering courses require literacy in some programming language (e.g., MATLAB, C++) for automating various types of numerical and symbolic computation. The ASEN 1320 course is for students with little or no prior experience in programming and teaches basic programming concepts and useful tools for solving engineering problems with an emphasis on aerospace applications.

Course Learning Goals

The goal of this course is to build the foundation in computing and programming required to succeed in the sophomore and junior curriculum in aerospace engineering and other related domains of engineering. Students will develop an understanding of the following concepts and skills in order to be able to code in C++ and MATLAB to solve basic computing problems:

- Understand the overall structure of computer programming.
- Understand the differences between a compiled (C++) and an interpreted language (MATLAB).
- Learn how to use different primitive data types such as integers, floating point, and strings.
- Learn how to implement fundamental programming constructs such as variables, assignment statements, expressions, conditionals, and iterative constructs.
- Learn how to create and manipulate 1D and 2D arrays, use arrays within looping constructs, and pass arrays to functions.
- Understand the scope of functions and know how to use functional programming.
- Learn how to read and write data and use file I/O.
- Understand the concepts of class, object, and object-oriented programming.
- Learn how to use C++ classes and MATLAB function/graphics handles.
- Develop skills to use basic data visualization functions in MATLAB.
- Develop skills to write, test, and debug code required to solve basic aerospace engineering application problems.

Course Schedule

Week(s)	Topic	Text Chapter
1	Introduction to C++, Program Structure	
2	C++: Variables, Operators (e.g., arithmetic, logical)	Ch 1.2 C++
3-4	C++: Flow of Control (e.g., if-else, loops)	Ch 2.1-2.3 C++
5	C++: Introduction to Arrays (e.g., 1D, 2D)	Ch 5.1,5.4 C++
6	C++: Functions (e.g., predefined, user-defined)	Ch 3.1-3.2 C++
7	C++: Function Scope Rules, Arrays in Function	Ch 3.3,5.2 C++
8	MATLAB: Intro, Vector Manipulation	Ch 1-3 MATLAB
9	MATLAB: Loops and Conditional Statements	Ch 4-5 MATLAB
10	MATLAB: Functions and Scope, M-files	Ch 6 MATLAB
11	MATLAB: Visualization and Plotting	Ch 9,12 MATLAB
12	MATLAB/C++: Read and Write, File I/O	Ch 9 MATLAB Ch 12 C++
13	MATLAB/C++: Structure	Ch 8 MATLAB Ch 6.1 C++
14	MATLAB/C++: Class, Object (e.g., MATLAB handles, Intro C++ OO Programing)	Ch 11 MATLAB Ch 6.2 C++
15	Advanced Topics	

Textbooks

- C++ Textbook - Walter Savitch (2016): Absolute C++, *6th Edition*, Pearson. Print version on reserve at CU Library and scanned chapters will be made available for students. https://www.colorado.edu/libraries/
- MATLAB Textbook - Stormy Attaway (2018), MATLAB, A Practical Introduction to Programming and Problem Solving, *5th Edition*, Elsevier.
  Free e-book version available for students from CU library:
  https://www.colorado.edu/libraries/

Supplemental Resources

- MATLAB MathWorks Documentation https://www.mathworks.com/help/matlab
- MATLAB Online Course https://matlabacademy.mathworks.com

Course Grading

Course grades will be determined based on:

- Recitation assignments (Coding Challenges) and participation (15%)
- In-class Exercises (10%)
- Homework Assignments (25%)
- Quizzes (10%)
- Practicum Exam on C++ (10%)
- Practicum Exam on MATLAB (10%)
- Final Projects (20%)

STUDENT EXPECTATIONS

- Students are expected to act professionally in the classroom. Unprofessional behavior that disrupts the learning environment in the classroom is not acceptable. Those who disrupt the learning environment will be subject to discipline.
- Students are expected to study for weekly quizzes, interview grading sessions, and turn in all the class work, including recitation assignments (coding challenges), homework assignments, and final projects. A passing grade will not be guaranteed by just showing up for lectures and recitations.
- B− grades and above are required to use ASEN 1320 as a prerequisite for CSCI 2270 (Data Structures) which is a pathway to a CS minor.
- ***Students are supposed to attend the recitation class that they have been assigned to***.
- Students may discuss and collaborate on the programming assignments, but students are NOT free to copy another student's assignment.
- Students are not allowed to use generative AI (like ChatGPT) to solve the assignments, Final Projects and Exams. Gen AI use in this course will not enhance student learning, nor serve the topic at hand.
- Students who are caught copying (or providing their assignment to another student) or using Generative AI tools for Homework Assignments, Coding Challenges, In-class Exercises, and Quizzes will receive a zero for that assignment. If a student is caught copying or using AI tools for the second time for the above-mentioned assignments, they will receive an "F" for the course and will be reported to the Honor Code office for further punitive action.
- Students who are caught copying or using Generative AI tools for the Final Projects and Practicum Exams will receive an "F" for the course and will be reported to the Honor Code office for further punitive action.

INSTRUCTOR EXPECTATIONS

- Students may expect the instructor, TA and TFs to be courteous, punctual, well organized, and prepared for lecture and other class activities; to answer questions clearly; to be available during office hours or to provide notification beforehand if they are unable to keep them; and to grade uniformly and consistently according to the posted guidelines.

INSTRUCTOR COMMUNICATION

- Students are encouraged to ask questions on homework assignments and final project during recitations, office hours, and via **Piazza**.
- Email will not be a primary communication method used in course correspondence for general questions about homework, syllabus & class policy, etc. Emails sent to instructors or TFs on such topics will go unanswered. Students should only email the instructors with questions or concerns regarding individual scheduling conflicts or personal issues. Instead, students must use Piazza for general questions about homework, syllabus, class policy, etc.
- Student communication that occurs within 24 hours of project, assignment, or exam deadlines, is not guaranteed to be addressed.
- All correspondence to instructors and TA and TFs will be handled during regular business hours: M-F 9 AM – 5 PM. Any messages sent to the instructional team outside these hours or during the weekend will go unanswered.

Accommodations

- 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.

PRACTICUM EXAMS

- There will be two practicum exams that assess the students' abilities to program in C++ and MATLAB.
- The practicum exams are closed notes: Students are not allowed to access internet, lecture slides, textbooks, etc., during the practicum exams. However, the students will be allowed to bring a cheat/crib sheet.

- **Date, Time, and Location of C++ Practicum Exam**: ~~Wednesday, March 5, 2025, at 6:00 PM in AERO 120~~

  Tuesday, March 4, 2025 at 6 PM in AERO 120
- **Date, Time, and Location of MATLAB Practicum Exam**: Wednesday, April 23, 2025 at 6 PM in AERO 120

HOMEWORK ASSIGNMENTS

- There will be approximately 10 homework assignments in total.
- No late homework submissions will be accepted.
- The lowest homework assignment grade will be dropped from your final grade.
- All homework assignments are to be turned in electronically via Gradescope in Canvas.
- Students are encouraged to collaborate with other students on homework assignments but must submit their own original work (i.e., students are not allowed to copy each other's code).

QUIZZES

- Quizzes will be administered weekly via Canvas.
- The lowest quiz grade will be dropped from your final grade.
- No late quiz submissions will be accepted. No make up will be accepted for quizzes.

IN-CLASS EXERCISES

- Some lectures contain a graded in-class exercise that must be completed by students.
- Some of the In-class Exercises are due at the end of the lecture.
- Late work will not be accepted, and students cannot make up missed work.
- The lowest in-class exercise grade will be dropped from your final grade.
- In-class exercises are graded as 0, 0.5 or 1. Students who make a reasonable effort to complete the in-class activity will receive full credit (i.e., 1). Students who do not make a reasonable effort to complete the activity will receive no credit. Students who submit incomplete codes or codes with several errors will receive partial credit (0.5).

CODING CHALLENGES (RECITATION ASSIGNMENTS)

- There will be weekly coding challenges that take place during recitation. Coding challenges are individual weekly assessments of a student's programming abilities.
- **The students will not be allowed to submit the coding challenge solutions if they do not attend the recitation class.**
- Some of the coding challenges must be completed and submitted during their assigned recitation time, and for some of the coding challenges the students will have time after the recitation to complete and submit them.
- Access to Coding Challenge prompt or working on the code before recitation is in violation of the CU Honor Code.
- Late work will not be accepted, and students cannot make up missed work.
- The lowest Coding Challenge grade will be dropped from your final grade.
- Students are not allowed to access generative AI or access any online resource during the coding challenge.
- Students are allowed to use the class notes and lecture slides during coding challenges.

FINAL PROJECTS

- There will two comprehensive final projects in place of the final examination: One on C++ and one on MATLAB.
- No late final project submissions will be accepted.

LATE POLICY

- No late submissions for recitation assignments (coding challenges), quizzes, homework assignments, and final projects will be accepted. Please see the Due Date Extension Policy below for an exception.

DUE DATE EXTENSION POLICY

- Students are responsible for contacting and working out an alternative plan with **Professor Ghobadi-Far** for submitting homework assignments, recitations, project, and any other assignments if these cannot be completed in time due to unexpected situations.
- These requests will be evaluated on a case-by-case basis, and assignment extensions require at least a 48-hour email notification prior to the assignment deadline.

ATTENDANCE POLICY

- Attendance at all lectures is expected, but is not counted towards the final grade. However, some of the in-class exercise given during the lectures will be due at the end of the lecture.
- Attendance at all recitations is required and closely monitored, and is counted towards grades. Students who do not attend the recitation session will not be allowed to submit Coding Challenges.
- Students are responsible for knowing the material presented at lectures and recitations, even in the case of students' absence when the material was presented.

REGRADE POLICY

- Manual regrading requests will be evaluated on a case-by-case basis, if students' final code is submitted to the Gradescope or MATLAB autograder before the submission deadline. Students will be asked to provide a detailed description of how the code works as well as a discussion of why the code has failed to pass the autograders' test.

General Policies

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 policies on classroom behavior and the Student Conduct and Conflict Resolution policies.

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. 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 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.

CU Boulder currently requires masks in classrooms and laboratories regardless of vaccination status. This requirement is a precaution to supplement CU Boulder's COVID-19 vaccine requirement. Exemptions include individuals who cannot medically tolerate a face covering, as well as those who are hearing-impaired or otherwise disabled or who are communicating with someone who is hearing-impaired or otherwise disabled and where the ability to see the mouth is essential to communication. If you qualify for a mask-related accommodation, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus. In addition, vaccinated instructional faculty who are engaged in an indoor instructional activity and are separated by at least 6 feet from the nearest person are exempt from wearing masks if they so choose.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID19, 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). In this class, if you feel ill or quarantined, **notify your TA or TF that you will be absent from recitation sessions**. You do not need to state the nature of your illness or provide a doctor's note, but you are required to provide notification by the end of Friday before recitation assignments are due at midnight. **There is no need to notify your absence from lectures.**

Accommodations 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 academic integrity policy. 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 the Honor Code (honor@colorado.edu; 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the Honor Code Office website.

Sexual Misconduct, Discrimination, Harassment And/Or Related Retaliation: CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. The university will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about university policies, reporting options, and the 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 incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting 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. In this class, please see the regular due date extension policy above. See the campus policy regarding religious observances for full details.