

AEROSPACE COMPUTING AND ENGINEERING APPLICATIONS

SPRING 2022

Material is preliminary and subject to change

Instructor:	Tomoko Matsuo	Email:	Tomoko.Matsuo@colorado.edu
Lectures:	M/W/F 9:05-9:55am	Room:	GOLD A2B70
Office Hours:	TH 8:10-9am Zoom		
TA:	Lyndsay Ruane	Email:	Lyndsay.Ruane@colorado.edu
Recitations:	W 10:10-11am (13) ECCR 235 / W 11:15am-12:05pm (14) ECCR 235		
Office Hours:	TBD In-person		
TF:	Anand Kappagantu	Email:	Anand.Kappagantu@colorado.edu
Recitations:	T 11:15am-12:05pm (11) ECCR 235 / W 4:50-5:40pm (18) COPILOT		
Office Hours:	T 2:30-4pm In-person		
TF:	Joshua Schmitz	Email:	Joshua.Schmitz@colorado.edu
Recitation:	TH 1:25-2:15pm (16) ECCR 235		
Office Hours:	TBD In-person		
TF:	Ben Capeloto	Email:	Beca2460@colorado.edu
Recitation:	T 12:20-1:10pm (12) ECCR 235		
Office Hours:	T 10-11:30am Zoom		
TF:	Benjamin Reynolds	Email:	Benjamin.Reynolds-1@colorado.edu
Recitation:	W 12:20-1:10pm (15) ECCR 235		
Office Hours:	TH 2:30-4pm Zoom		
TF:	Thomas Dunnington	Email:	thdu5070@colorado.edu
Office Hours:	T 11:30am-12:30pm / F 11:30am-1:30pm Zoom		
TF:	Jack Stohs	Email:	Jack.Stohs@colorado.edu
Office Hours:	W 2:30-4pm / F 10:30am-12pm Zoom		
TF:	Janelle Nedrow	Email:	Sarah.Nedrow@colorado.edu
Office Hours:	TBD Zoom		
TF:	Ariana Bower	Email:	Ariana.Bower@colorado.edu
Office Hours:	T 1:30-3pm / TH 9:30-11am Zoom		
Web Site:	Canvas (https://canvas.colorado.edu) ^a		
Q&A:	Piazza ^b		
IDE:	MATLAB ^c AWS Cloud9 ^d		
Modalities:	All lectures ^e , recitations and office hours are offered at scheduled times via Zoom during remote learning. See Canvas for Zoom Meeting ID.		

^aQuizzes are administered through Canvas. All assignments can be submitted through Canvas

^bPiazza is used for class-wide Q&A and discussion, and can be accessed via Canvas

^cMATLAB license is available for CU students at no cost from <https://oit.colorado.edu/>

^dAWS Cloud9 Integrated Development Environment used for C++ can be accessed via course website

^eRecording is made available via course website

Course Details

Course Objectives:

Most aerospace engineering programs require literacy in some programming language (e.g., MATLAB, C++) for automating various types of numerical and symbolic computation. The 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 basic 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 code in C++ and MATLAB to solve basic computing problems:

- Understand the overall structure of computing program.
- Understand the differences between a compiled (C++) and an interpreted language (MATLAB).
- Know how to use different primitive data types such as integers, floating point, and strings.
- Know how to implement fundamental programming constructs such as variables, assignment statements, expressions, conditionals, and iterative constructs.
- Know 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.
- Know how to read and write data and use file I/O.
- Understand the concepts of class, object, and object-oriented programming.
- Know to how 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.

Anticipated Course Schedule:

Week(s)	Topic	Text Chapter
1	Introduction to C++ and MATLAB, 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 <i>Final Project Introduction</i>	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 Programming)	Ch 11 MATLAB Ch 6.2 C++
15	Wrap-up	

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 on the basis of:
 - Recitation assignments and participation (10%)
 - Quizzes¹ (15%)
 - Homework assignments² (25%), plus interview-grading of one C++ (5%) and one MATLAB assignment (5%)
 - Final project (15%), plus interview-grading (5%)
 - Practicum exam on C++ (10%) and MATLAB (10%)
- Students are expected to study for weekly quizzes, interview grading sessions, and turn in all the class work, including lab assignments, homework assignments, and a final project. **A passing grade will not be guaranteed by just showing up for lectures and recitations.**
- The lowest quiz grade will be dropped.
- **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.**

Instructor Inquiry Policy:

There are many students in this class. **For the sake of fairness and efficiency please always try to get your questions answered by your TA and TF first.**

Assignments Policy and Logistics:

- **No late submissions will be accepted.** No late submissions for recitation assignments, quizzes, homework assignments, and final project. (See the Due Date Extension Policy below for an exception)
- **Two homework assignments as well as final project will be graded through an 10-minute interview with one of TA and TFs on the assignment and project report submitted in the previous week.** The purpose of interview grading is to test students' understanding of the code and provide students with an opportunity to ask questions. Students are responsible for scheduling the interview grading sessions as instructed. It is advisable to be on Zoom for the scheduled appointment 5 minutes early and use the extra time to prepare for the interview. There is a 1-minute grace-period for being late, after that it is 10% off for each minute the student is late. Not showing up without advance notification results in zero credit. (See the Interview Grading Scheduling Policy below for an exception)

¹weekly online

² 10 assignments in total

- Students are encouraged to ask questions on homework assignments and final project during recitations, office hours, and via Piazza.
- Students may discuss and collaborate on the programming assignments, but students are NOT free to copy another student's assignment. **Students who are caught copying (or providing his or her assignment to another) will receive an "F" for the course and reported to the Honor Code office for further punitive action.**
- All homework assignments are to be turned in electronically via Canvas. **Students should make an effort to turn in assignments that are written neatly and organized with a professional appearance.** Proper documentation and commenting should be used to explain programming concepts employed. Students' name and section number and the date must be at the top right of the first page of the assignment write-up and code files.

Due Date Extension Policy:

Students are responsible for contacting and working out an alternative plan with your TA or TF and the instructor 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 48 hours e-mail notice.**

Interview Grading Scheduling Policy:

Students are responsible for scheduling interview grading with your TA or TF by Friday before the interview grading week. In case of unexpected circumstances, students must contact and work out an alternative plan with your TA or TF for rescheduling interview grading **via e-mail at least 24 hours notice.**

Attendance Policy:

Attendance at all lectures will be expected, but will not be counted towards grades. Attendance at all recitations will be required and closely monitored, and will be counted towards grades. Students are responsible for knowing the material presented at lectures and recitations, even in the case of students' absence when the material was presented.

Manual Regrading Policy:

Manual regrading requests will be evaluated on a case-by-case basis, if students' final code is submitted to the Gradescope or MATLAB Grader 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 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). 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.