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 | AERO 467		
TA:	Gaurav Roy	**Email:**	Gaurav.Roy@colorado.edu
Recitations:	W 12:20-1:10pm (**15**) | ECCR 143 / TH 2:00pm-2:50pm (**16**) | ECCR 143		
Office Hours:	TBD		
TA:	Chris Lolkema	**Email:**	Christopher.Lolkema@colorado.edu
Recitations:	W 10:10-11:00am (**13**) | ECCR 143		
Office Hours:	TBD		
TA:	Thomas Dunnington	**Email**	thdu5070@colorado.edu
Recitation:	TH 1:25-2:15pm (**18**) | AERO N100		
Office Hours:	T 4:00-5:30pm | TBD		
TA:	Ariana Bower	**Email:**	Ariana.Bower@colorado.edu
Office Hours:	M 5:30-6pm | TBD / W 5:30-6:00pm | TBD		
TA:	Austin Hunter	**Email**	Austin.Hunter-1@colorado.edu
Office Hours:	TBD		
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.		

[a] Quizzes are administered through Canvas. All assignments can be submitted through Canvas
[b] Piazza is used for class-wide Q&A and discussion, and can be accessed via Canvas
[c] MATLAB license is available for CU students at no cost from `https://oit.colorado.edu/`
[d] AWS Cloud9 Integrated Development Environment used for C++ can be accessed via course website
[e] Recording 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 programing 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 requited 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 *Final Project Introduction*	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	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 Work and Participation[1] (10%)
  - In-class Exercise[2] (10%)
  - In-class Weekly Quizzes[3] (10%)
  - Practicum Exam on C++, scheduled during recitation (15%)
  - Practicum Exam on MATLAB, scheduled during recitation (15%)
  - Final Exam, scheduled during the final exam period (10%)
  - Homework assignments[4] (15%)
    - One randomly selected C++ assignment will be interview graded.
    - One randomly selected MATLAB assignment will be interview graded.
  - Final project (15%) - The project will be interview graded for a full credit.
- 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 who are caught **copying or providing his or her assignment to another** will be reported to **the CU Honor Code office** for investigation and punitive action and likely **receive an "F" for the course**.
- Students who **access unauthorized materials during the exam** will be found in violation of the CU Honor Code and automatically **receive an "F" for the course**.

Student Expectations:

- Students are expected to study for weekly in-class quizzes, interview grading sessions, and turn in all the class work, including recitation work, in-class exercise, homework assignments, and a final project. **A passing grade will not be guaranteed by just showing up for lectures and recitations.**
- Students may discuss and collaborate on the programming assignments, but students are NOT free to copy another student's assignment.
- Students' assignment code submitted to Gradescope and Matlab Grader will be automatically checked for similarity with others' code. Students AWS Cloud9 environments will be regularly monitored by the instructor and TA.

[1] the recitation work is graded for completion
[2] the in-class exercise is graded for completion
[3] the lowest quiz grade will be dropped
[4] approximately 10 homework assignments in total

Instructor and TA Expectations:

- Students may expect the instructor and TAs to be courteous, punctual, well-organized, and prepared for lecture and recitation, to answer your 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 policies and guidelines described in the syllabus and on Canvas.

Instructor and TA Communication:

- Students are encouraged to ask questions on homework assignments and final project during classes and recitations, office hours, and via Piazza.
- There are many students in this class. **For the sake of fairness and efficiency please always attempt to get your questions answered by TA first.**
- There is no guarantee that the instructor and TAs will respond to your inquiries after 5pm and on weekends.

Assignments and Final Project Policy and Logistics:

- There will be approximately 10 homework assignments in total.
- **No late submissions will be accepted**.
- There will be one comprehensive final project involving both C++ and MATLAB.
- All homework assignments and final project are to be turned in electronically via Canvas, Gradescope, or MATLAB Grader. **Proper documentation and commenting should be used to explain programming concepts employed.**
- **Two homework assignments and final project will be graded through a 10-minute interview with one of TAs on the code submitted in advance.** Interview grading will be required in order to receive a full credit. 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. In case of unexpected circumstances, students must contact and work out an alternative plan with your TA for rescheduling interview grading **via e-mail at least 24 hours notice.**

- Students who are caught **copying or providing his or her assignment to another** will be reported to **the CU Honor Code office** for investigation and punitive action and likely **receive an "F" for the course**.

Quize Policy:

- Quizzes will be administered weekly in-class.
- **There will be no make-up quizzes in this class.** The lowest quiz grade will be dropped.

Exam Policy:

- There will be two 45-minute practicum exams which assess the students abilities to program in C++ and MATLAB, respectively. Each recitation section will receive a different problem.
- There will be a final exam during the exam period.
- Students are NOT allowed to share the exam problem or exam code with other students.
- The exams are individual, closed-book, closed-notes, closed-internet, and held during recitation. Students are not allowed to reference previous code, notes, or access the internet during the exam.
- Students who **access unauthorized materials during the exam** will be found in violation of the CU Honor Code and automatically **receive an "F" for the course**.

Due Date Extension Policy:

- Students are responsible for contacting and working out an alternative plan with your recitation TA for submitting homework assignments, recitation work, final 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.**

Attendance Policy:

- Attendance at all lectures is expected and monitored, but will not be counted towards grades. **Attendance at all recitations is required and monitored, and is 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.

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 Grader autograder before the submission deadline and the request is made with two weeks of the 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 recitation TA 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.