Aerospace Computing and Engineering Applications

Fall 2020

Material is preliminary and subject to change

Instructor:	Tomoko Matsuo	**Email:**	Tomoko.Matsuo@colorado.edu
Lectures:	M/W/F 8:00-8:50am	**Zoom:**	Meeting ID: 979 4161 1318
Office Hours:	M 4:00-5:00pm		
TA:	Lyndsay Ruane	**Email:**	Lyndsay.Ruane@colorado.edu
Recitations:	(109) TH 11:30am-12:20pm / (110) TH 12:40-1:30pm		
Office Hours:	TBD	**Zoom:**	Meeting ID: 910 5129 0602
TF:	Anand Kappagantu	**Email:**	Anand.Kappagantu@colorado.edu
Office Hours:	TBD	**Zoom:**	Meeting ID: 789 766 456
TA:	Akash RatheeshBabu	**Email:**	Akash.RatheeshBabu@colorado.edu
Recitations:	(113) T 4:35-5:25pm / (105) W 10:20-11:10am		
Office Hours:	TBD	**Zoom:**	Meeting ID: 979 3768 2281
TF:	Margaux McFarland	**Email:**	Margaux.Mcfarland@colorado.edu
Office Hours:	TBD	**Zoom:**	Meeting ID: 935 9235 6248
TA:	Lea Chandler	**Email:**	Lea.Chandler@colorado.edu
Recitations:	(102) T 11:20am-12:10pm / (103) T 12:30-1:20pm		
Office Hours:	TBD	**Zoom:**	Meeting ID: 985 8767 2270
TF:	Brendan Palmer	**Email:**	Brendan.Palmer@colorado.edu
Office Hours:	TBD	**Zoom:**	Meeting ID: 215 180 7308
Modalities:	All lectures[a] are delivered remotely at scheduled days and times		
	One recitation section meets in-person[b], but otherwise remotely		
Web Site:	Canvas (https://canvas.colorado.edu)		
Remote Activity:	All synchronous activity is via Zoom Web Conferencing[c]		
Q&A:	Piazza[d]		
MATLAB IDE:	MATLAB [e f]		
C++ IDE:	AWS Cloud9 [g]		
Quizzes:	Quizzes are administered through course website		
Homework:	All assignments[h] can be turned in via course website		

[a] Recording is made available via course website

[b] AERO 141 (PILOT) equipped with lab computers is used for weekly in-person recitation

[c] Zoom software and training are available from https://oit.colorado.edu/

[d] Piazza is used for class-wide Q&A and discussion sessions, and can be accessed via course website

[e] MATLAB Online https://www.mathworks.com/products/matlab-online.html

[f] MATLAB license is available for CU students at no cost from https://oit.colorado.edu/

[g] AWS Cloud9 Integrated Development Environment (free) is used for C++ code development

[h] Homework is assigned via Gradescope and MATLAB Grader that can be accessed 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 labs (10%), quizzes[1] (15%), homework assignments[2] (30%), and a final project (20%). C++ homework assignments interview-grading (10%), MATLAB homework assignments interview-grading (10%), and final project interview-grading (5%).

- 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 labs.**

- **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.

Assignments Policy and Logistics:

- **No late submissions will be accepted**. No late submissions for labs, quizzes, homework assignments, and final project. (See the Due Date Extension Policy below for an exception)

- **Some homework assignments as well as final project will be graded through an 10-minute interview with one of TAs/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, at 6 minutes late you get a zero. Not showing up without emailing in advance results in zero credit. (See the Interview Grading Scheduling Policy below for an exception)

- Students are encouraged to ask questions on homework assignments and final project during labs, 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 Deans office for further punitive action.**

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[1] weekly online
[2] 10 assignments in total

- 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. If students' assignment is not legible for grading, students will receive one and only one warning. Further failure to turn in a legible and clearly organized assignment after the first warning will result in zero credit for that assignment.

Instructor Inquiry Policy:
There are many students in this class. The instructor can quickly become overwhelmed with emails when students decide to contact her directly. **For the sake of fairness and efficiency please always try to get your questions answered by your TA and TF first.**

Due Date Extension Policy:
Students are responsible for contacting and working out an alternative plan with your TA and the instructor for submitting homework assignments, labs, projects, 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.** The extension policy will be strictly enforced, so you are expected to plan ahead and manage your time well.

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 48 hours notice.** The rescheduling policy will be strictly enforced, so you are expected to plan ahead and manage your time well.

Attendance Policy:
Attendance at all lectures and labs will expected, recorded and closely monitored, but will not be counted towards grades. Students are responsible for knowing the material presented at lectures and labs, even in the case of students' absence when the material was presented. Students who fail to attend lectures and labs regularly will often receive a failing grade and have to repeat the class the following semester.

General Policies

Classroom Behavior:
Students and faculty each have responsibility for maintaining an appropriate learning environment. Turn your cell phone (talk and text), put away newspapers and magazines, and refrain from having disruptive conversations during class. 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 Code of Conduct.

Requirements for COVID-19:
As a matter of public health and safety due to the pandemic, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements, and public health orders in place to reduce the risk of spreading infectious disease. Required safety measures at CU Boulder relevant to the classroom setting include:

- maintain 6-foot distancing when possible,

- wear a face covering in public indoor spaces and outdoors while on campus consistent with state and county health orders,

- clean local work area,

- practice hand hygiene,

- follow public health orders, and

- if sick and you live off campus, do not come onto campus (unless instructed by a CU Healthcare professional), or if you live on-campus, please alert CU Boulder Medical Services.

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 policies on COVID-19 Health and Safety and classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please see the Accommodation for Disabilities statement on this syllabus. Before returning to campus, all students must complete the COVID-19 Student Health and Expectations Course. Before coming on to campus each day, all students are required to complete a Daily Health Form. In this class, you may be reminded of the responsibility to complete the Daily Health Form to be able to participate in in-person

recitations in AERO 141 (PILOT). Students who have tested positive for COVID-19, have symptoms of COVID-19, or have had close contact with someone who has tested positive for or had symptoms of COVID-19 must stay home and complete the Health Questionnaire and Illness Reporting Form remotely.

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 or injury, see Temporary Medical Conditions under the Students tab 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. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

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 policy may include: 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 at the Honor Code Office website.

Sexual Misconduct, Discrimination, Harassment And/Or Related Retaliation:
The University of Colorado Boulder (CU Boulder) is committed to fostering a positive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct intimate partner abuse (including dating or domestic violence), stalking, protected-class discrimination or harassment by 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 cureport@colorado.edu. Information about the OIEC, university policies, anonymous reporting, and the campus resources can be found on the OIEC website.

Please know that faculty and instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about options for reporting and support resources.

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 here for full details.