

Aerospace Computing and Engineering Applications

Spring 2021

Instructor: Nicholas Rainville Email: Nicholas.Rainville@colorado.edu Zoom:
Office Hours: W 4:30-5:30pm

Lecture Section: M/W/F 8:00-8:50am

TA: Lyndsay Ruane Email: Lyndsay.Ruane@colorado.edu

Office Hours: W 10:00-11:00a Room: ECCR 235

Recitation Section: 011, 013

TF: Anand Kappagantu Email: Anand.Kappagantu@colorado.edu

Office Hours: W 5:30-6:30p Zoom:

Recitation Section: 012, 014

TF: Maya Greenstein Email: maya.greenstein@colorado.edu Zoom:

Office Hours: W 11:00a-12:00a cuboulder.zoom.us/j/8991710244

Recitation Section: 017

TF: Joshua Schmitz Email: josc5270@colorado.edu

Office Hours: Th 2:00-300p Zoom: <https://cuboulder.zoom.us/j/4234726262>

Recitation Section: 016

TF: Ben Capeloto Email: benjamin.capeloto@colorado.edu Zoom:

Office Hours: Th 1:00-2:00p cuboulder.zoom.us/j/95936849677

Recitation Section: 015

TF: Ian Faber Email: Ian.Faber@colorado.edu

Office Hours: M 1:00p-2:00p Zoom: _

Office Hours: F 5:00p-7:00p

TF: Thomas Dunnington Email: thdu5070@colorado.edu

Office Hours: T 1:20p-2:30p Zoom: _

Office Hours: F 12:00p-2:00p

Course Web Site: <https://canvas.colorado.edu/>

Q&A: Piazza is used for class wide discussions and questions. See the course web page on Canvas for the Piazza link.

Lectures: Lectures will be delivered in-person.

Recordings: Lectures will be recorded and the videos will be made available on Canvas.

Attendance: Attendance is required for all recitations and will count towards your grade.

Quizzes: Quizzes will be administered through Canvas

Homework: All assignments will be submitted through Canvas

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 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 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.

Course Schedule:

Week	Topic
1	Introduction to C++ and MATLAB, Program Structure
2	C++: Variables, Operators (e.g., arithmetic, logical)

3	C++: Flow of Control (e.g., if-else, loops)
4	C++: Flow of Control (e.g., if-else, loops) Continued
5	C++: Introduction to Arrays (e.g., 1D, 2D)
6	C++: Functions (e.g., predefined, user-defined)
7	C++: Function Scope Rules, Arrays in Function
8	MATLAB: Intro, Vector Manipulation
9	MATLAB: Loops and Conditional Statements
10	MATLAB: Functions and Scope, M-files Final Project Introduction
11	MATLAB: Visualization and Plotting
12	MATLAB/C++: Read and Write, File I/O
13	MATLAB/C++: Structure
14	MATLAB/C++: Class, Object (e.g., MATLAB handles, Intro C++ OO Programming)
15	Wrap-up

Textbooks:

- Walter Savitch (2016): Absolute C++,6th Edition, Pearson.
- Stormy Attaway (2018), MATLAB, A Practical Introduction to Programming and Problem Solving,5th Edition, Elsevier – **eBook available from CU library**

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:

- Quizzes (20%)
- Recitation Participation (5%)
- Homework Assignments (30%)
- Final project (20%)
- Interview Grading (25%)
 - C++ (7.5%)
 - MATLAB (7.5%)
 - Final project (10%)

A grade of a B– or above is required to use ASEN 1320 as a prerequisite for CSCI 2270 (Data Structures) which is a pathway to a CS minor.

Assignment and Quiz Policy:

- **No Late Submissions** will be accepted for recitation assignments, quizzes, homework assignments, or the final project.
- **Your lowest quiz grade will be dropped**

- Two homework assignments and the final project will be graded through a 10-minute interview with one of TAs/TFs on the assignment and project report submitted the previous week. The purpose of interview grading is to test students' understanding of the code and to 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 late. At 6 minutes late you get zero credit. Not showing up without emailing in advance results in zero credit.
- All homework assignments will be turned in electronically via Canvas. 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.

Group Assignments:

- 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.

Communication Policy:

- Students are encouraged to ask questions on homework assignments and the final project during recitations, office hours, and via Piazza.
- There are many students in this class. For the sake of fairness and efficiency please always try to get your questions answered by your TAs and TFs first.

Interview Grading Scheduling:

- 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.

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 & Conflict Resolution policies](#).

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 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.

As of Aug. 13, 2021, CU Boulder has returned to requiring masks in classrooms and laboratories regardless of vaccination status. This requirement is a temporary precaution during the delta surge 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.

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. In this class, if you are sick or quarantined, notify the course instructor (nicholas.rainville@colorado.edu) that you will be absent. You do **not** need to state the nature of your illness or provide a doctor’s note, but you are required to provide notification within 5 days of the lecture or project section absence.

Accommodation 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 website](#).

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

The University of Colorado Boulder (CU Boulder) is committed to fostering an inclusive and welcoming learning, working, and living environment. CU Boulder 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 OIEC, university policies, [reporting options](#), and the campus resources can be found on the [OIEC website](#).

Please know that faculty and graduate instructors have a responsibility to inform OIEC when 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.

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, you must let the instructors know of any such conflicts within the first two weeks of the semester so that we can work with you to make reasonable arrangements.

See the [campus policy regarding religious observances](#) for full details.