

# CSCE 496/896: Robotics: Unmanned Aerial Systems

## Instructor

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Office hours:

Self-scheduled at <https://carrick.youcanbook.me> and by appointment

## Teaching Assistant

Mike (aka William) Turner  
Wednesday 1-2pm and Thursday 2-3pm

- Go to the CSE Student Resource Center Online <https://go.unl.edu/cse-src-zoom>
- You must log in to Zoom with their UNL Single-Sign-On account.
- Once there, tell a host about the course you need (either via chat text or audibly by mic).
- Ask for “William Turner,” or “CSCE 496-006,” or “Robotics UAV.”
- You will be put in a breakout room with Mike.

## Course Info

Lecture: M 2:30pm - 4:20pm in Avery 110

Lab: W 2:30pm - 4:20pm in Avery 110

Online on Canvas

Mondays: Lecture in class and live on zoom. Recordings of classes will also be available on Canvas if you are unable to attend. If you do not attend in person, you will need to submit a response paper or video to receive participation credit

Wednesdays: Hands-on lab session where only half the class attends each week. We will learn to fly, solder/assemble drones, and other hands-on (socially distant) stuff for as long as Covid allows us to meet in person. If you cannot attend these for whatever reason, there will be alternative activities for you to perform.

Canvas Learning: Additional materials and lectures will be posted online to supplement learning due to the reduced class and lab time due to COVID.

## Course Description

Unmanned Aerial Systems (UASs or drones) are increasingly being used for everything from agriculture to atmospheric science and have been proposed for uses such as delivering packages and locating survivors in burning buildings. This class will be focused on solving a real-world challenge with drones that cannot be solved by off-the-shelf systems or algorithms. We will start with class, lab, and homeworks to ensure that everyone has a common baseline. Then we will move onto the main project.

The main project in the class will be for us to create an autonomous drone “Quidditch” league. We will split into small groups and each group will focus on developing systems (e.g. grippers/etc) and algorithms (e.g. detect balls/other drones/etc) to act as the chasers, beaters, keepers, and seekers. And of course one team will need to program the snitch. There will also be a team dedicated to creating a simulation environment and rules for this, but we will also do work at the real Nimbus Quidditch Pitch as we can.

## Canvas, Communication, and Course Website

The primary mode of communication for this course will be through Canvas. Around the start of each week an announcement will be posted on Canvas with information on the upcoming week. Pay close attention to these as this is the primary way that I will communicate with you.

Please also make sure that you have enabled notifications in Canvas so that you do not miss important announcements.

If you need to get in touch with me, the best way is through email. I prefer that you email me directly from the email you check as messages through Canvas do not always keep attachments and formatting.

In addition to Canvas, the key materials will be posted on the public course website: <http://cse.unl.edu/~carrick/courses/2020/496/> This is mainly for archival purposes and to share with friends and family who may be interested to see some of the topics you are covering and assignments.

This syllabus is subject to change, you will find the most up-to-date version of the syllabus on the course website and Canvas.

## Prerequisites and Requirements

**Prerequisites:** CSCE 156, equivalent programming experience, or instructor permission; Junior, senior, or graduate standing.

**Recommended Prerequisites:** CSCE236 or ELEC222; CSCE 310/311; MATH 314.

**Familiarity with:** C++, python, or other high-level languages; embedded systems; basic data structures; GNU/Linux operating systems; linear algebra; introductory physics; probability and statistics.

## Textbooks

None. Online readings will be provided as needed.

## Assignments and Grading

All assignments are due via Canvas by the due date and time specified.

Your final grade will be composed of a number of components. These are:

| Percentage | Assignment                      |
|------------|---------------------------------|
| 15%        | Participation and Engagement    |
| 15%        | Quizzes                         |
| 30%        | Homework                        |
| 30%        | Project                         |
| 10%        | Peer Response Papers and Videos |

## Participation and Engagement

Participation and engagement in class and lab is critical in this course and counts for 20% of your grade. You will receive points for each class or lab you attend and engage in if you are in person or online synchronously. If you are unable to attend a class or lab, you can do an alternative activity to receive the points.

If you are unable to attend a lecture synchronously, then you can receive these points by writing a 2 page response paper or by submitting a 3-5 minute response video based on viewing the lecture asynchronously. These will be graded, so simply submitting something is not sufficient to show engagement.

If you are unable to attend a lab, then you can receive these points by writing a 2 page response paper or by submitting a 3-5 minute response video based on assigned topics (e.g. extra videos or readings). These will be graded, so simply submitting something is not sufficient to show engagement.

## Quizzes

There will be regular quizzes of varying length and points. Some will be announced and others will not be announced. These will cover topics from class, lab, online lectures, online videos, online readings, and other assigned materials. Quizzes are open book/internet, but collaboration with others is not allowed.

## Homework

There will be at least two homeworks over the course of the semester. These are **individual** assignments. It is ok to discuss concepts behind the problems in the homeworks with classmates, however, you cannot do them together. If you do discuss problems with classmates or other people, you must acknowledge this on the assignment (this will not lead to any grade reduction). As a metric for what level of discussion is allowed, it is ok to meet and talk over coffee about the assignment. It is not ok to show someone your solution or to work on the details of the problems together. In general any discussions should be limited to discussion and you should not be taking significant notes on the problems. If in doubt, ask me questions about assignments.

Homeworks are due via Canvas. The homework should be submitted as a pdf for the written part and a zip file with the code with all parts required to compile. Late homeworks will receive a 15 point deduction per 24 hours late.

## Final Project/Challenge

Note: The scope of the final project will likely change based on the current COVID-19 conditions. In fully remote situations we may need to change this from group projects to individual projects.

Details on the final project will be given in class. Overall the final project is worth 30% of your grade. The breakdown of the grading for the project is roughly:

| Percentage | Component                   |
|------------|-----------------------------|
| 5%         | Project Status Presentation |
| 10%        | Project Status Report       |
| 5%         | Final Project Presentation  |
| 10%        | Final Project Report        |

For the final project there will be a status report and presentation and a final report and presentation. The project report is a final report describing your project and outcome. The presentation and demo will show your robot and algorithms in action to the class and the broader UNL community. Throughout the final project you will also do self and group evaluations. Grades may not be the same for each member in the group depending on the level of participation of each person.

The final project report and presentations will occur final week of class. Further details on the final project will be given in class.

## Peer Response Papers and Videos

You will have to do two feedback papers or videos (your choice). You will be assigned another project group and you will need to provide feedback on their presentation and report. Once for the status report and once for the final project. These can either be in the form of a 2-3 page paper or a 3-5 minute videos. Additional details will be given in class. The final one of these will be due the last week of class.

## 496 Versus 896

This course is highly integrated and there are only small differences between the 496 and 896 versions of the course. For 896, the homeworks and labs will have additional questions and parts that are optional for

students in 496.

## University Writing Center

The Writing Center, located in 102 Andrews Hall and satellite locations from 5-7 pm in Adele Hall , is a free service for all UNL students, faculty, and staff. You can work with an individual writing consultant on any type of writing at any stage in your writing process. For an appointment, call 472-8803 or schedule online at <https://www.unl.edu/writing/home>.

## CSE and UNL Policies

Academic honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's Student Code of ConductLinks to an external site. addresses academic dishonesty. Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision.

All students enrolled in any computer science course is bound by the Computer Science and Engineering academic integrity policy:

<http://cse.unl.edu/academic-integrity-policy>

You are expected to read, understand, and follow this policy.

For this course, do not plagiarize (writing or code) and make sure to properly cite any sources you use. Any cheating or plagiarism will be reported to the Chair of your department and your Dean, and may result in zero credit for that assignment and an F for the course.

The CSE Department has an anonymous suggestion box:

<http://cse.unl.edu/department/suggestion.php>

that you may use to voice your concerns about any problems in the course or department if you do not wish to be identified.

## Counseling and Psychological Services

UNL offers a variety of options to students to aid them in dealing with stress and adversity. Counseling and Psychological & Services (CAPS); is a multidisciplinary team of psychologists and counselors that works collaboratively with Nebraska students to help them explore their feelings and thoughts and learn helpful ways to improve their mental, psychological and emotional well-being when issues arise. CAPS can be reached by calling 402-472-7450. Big Red Resilience & Well-Being (BRRWB) provides one-on-one well-being coaching to any student who wants to enhance their well-being. Trained well-being coaches help students create and be grateful for positive experiences, practice resilience and self-compassion, and find support as they need it. BRRWB can be reached by calling 402-472-8770.

## Disabilities

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can discuss options privately. To establish reasonable accommodations, I may request that you register with Services for Students with Disabilities (SSD). If you are eligible for services and register with their office, make arrangements with me as soon as possible to discuss your accommodations so they can be implemented in a timely manner. SSD contact information: 232 Canfield Admin. Bldg.; 402-472-3787.

## Face Coverings

Please refer to the university face covering policies and this syllabus information:

<https://www.unl.edu/facultysenate/Face%20Coverings%20Syllabus%20Statement%20July%202020.pdf>

If you do not wish to wear a face covering, and do not have an exemption, you are welcome to attend the class via zoom.