

CS450HO – Robotics Design and Fabrication, Honors Choate Rosemary Hall

Fall Term 2021

Instructor Information

Instructor	Email	Class Location	Home Location
Ms. Clark (she/her/hers)	dclark@choate.edu	Lanphier Center for Mathematics and Computer Science, Room 118	Hall House 2/3, 43 N Elm Street

Course Description

CS450, Robotic Design and Fabrication has been redesigned for the Fall 2021 term. This class will go over robotics engineering concepts and robotic fabrication using the FIRST Robotics Competition (FRC) as the learning mechanism. We will be learning core FRC concepts to best prepare students for the competition season in winter term 2022.

Class Meeting Times

This class meets during **C Block**: Monday's 11:30AM-12:40PM; Wednesday's 9:20AM-10:30AM; Friday's 8AM-9:10AM.

Grade Breakdown

Grades in this course will be holistic and based on Engineering Notebook submissions, project work, classwork, assigned homework, participation, attitude and teamwork skills. The Engineering Notebook and project work are described below.

This class will consist of one mini project and one long-term project, both centered around past FRC design challenges. These will make up the bulk of your grade and will be completed in small groups. If you find you are having trouble with a team member equally contributing to the project, contact Ms. Clark to schedule a team conference to discuss the issues and find a resolution for all team members. Project management and conflict resolution are not only critical skills to have on a competitive FRC Team, but they are critical skills for high school, university, and the workplace. If for some reason the conference does not resolve the issue,

your project grade can be individually impacted even if your team is successful in the project challenges.

The final project will also include a technical report as well as a team presentation to the class. There will also be periodic design reviews and informal presentations throughout the term to simulate an FRC build season environment.

Classwork will mainly consist of worksheets that go along with the daily technical lessons. There may not be graded classwork every day. When there is you will turn in either a paper worksheet in Ms. Clark's drop-off bin or submit a digital assignment on Dropbox. Each student will have a personal Dropbox folder to submit all assignments.

You will be expected to keep an Engineering Notebook design log during the mini project and long-term project. You may use a physical notebook or a digital notebook on your iPad. The following items are expected in the notebook (written legibly in the writing utensil of your choice if using physical notebook - I am a big fan of glitter gel pens, so go as crazy with the colors as your heart desires):

- Complete an entry every time you work on the project. Thus, entries will include written notes from research, sketches, calculations, and ideas/brainstorming lists.
- Every entry should be dated in the top left corner of the page.
- Include sources for research note entries.
- Annotate all sketches so an outside reader can understand what is being displayed.
- When completing any calculations, write out all equations used, define the variables and/or inputs and outputs, and include units. (This will help you when you try to remember how to do the calculation again during build season!)
- Create a title for any idea lists or brainstorming lists you write down so an outsider reader can understand what is being communicated.

Homework will be assigned periodically, but due to the heavy project load involved in this course, it will not be assigned often, and weekend homework will be avoided whenever possible.

Late Work Policy

If you are having difficulty completing an assignment on time, please come to me right away so we can talk about the issue and come to a resolution. I am a very understanding person and know that the pressure of boarding school classes can be daunting, but I cannot help you if you do not effectively communicate with me. Late work will be accepted under certain circumstances only if you communicate why the work is late to me. Deductions for late work will be decided on a case-by-case basis.

FIRST Robotics Team 7407 – The Wired Boars

As a part of the ARC, students in this course will participate on FRC Team 7407 for the 2021-2022 season. ARC students are highly encouraged to attend the Sunday sessions with the full FRC Team and participate in other areas of the team, such as community outreach, marketing, competition pit design and team socials. FIRST is truly a program where you will get out what you put in, and it has a lot to give you when you give it your all. Being on an FRC Team in high school absolutely changed my life. It is truly the hardest fun you ever have and will shape you into incredible future leaders in science and engineering!

What is FIRST@?

Accomplished inventor Dean Kamen founded FIRST® (For Inspiration and Recognition of Science and Technology) in 1989 to inspire an appreciation of science and technology in young people. Based in Manchester, N.H., FIRST designs accessible, innovative programs to build self-confidence, knowledge, and life skills while motivating young people to pursue opportunities in science, technology, and engineering. With support from over 200 of the Fortune 500 companies and more than \$25 million in college scholarships, the not-for-profit organization hosts the FIRST® Robotics Competition for students in Grades 8-12. Students work with professionals across a wide range of disciplines including hardware and software engineering, strategy, design, and business to build a robot and compete in a game following rule established each year by FIRST. Each team has approximately 7 weeks to design, build and tests their robots before they head out to competitions regionally and if they succeed, globally. The short timeframe and the intense teamwork required to get a robot operational is an incredible experience for students – it imitates many of the aspects of real-life career experiences.

Ms. Clark's Classroom Rules

1. **Be kind to all.** Kindness is always #1, and we treat all our fellow students, teachers, school staff and ourselves with respect.
2. **No questions are dumb questions!** Never feel afraid to ask a question if you don't understand something or need more information.
3. **We learn together.** Everyone brings a unique perspective to the table, and we all have something to learn from one another.
4. **Constructive feedback is always welcome.** If you want to see something change in the classroom, you are always welcome to come chat with me or send me an email. I can't promise all requested changes will be implemented, but I will do my best to come to make reasonable accommodations.
5. **If you need a minute, take a minute.** We all know 2020-2021 has been a real doozy, and it is perfectly normal if you experience increased stress or anxiety as a result. If you need a small break, feel free to either tell me in person or over Teams Chat and you are welcome to grab relaxation items from the supplies cart. Please refrain from using cellphones during this time. If you don't feel comfortable talking to me in person and I

am not at my computer, the no questions asked action will be grabbing your labeled Play-Doh from the supplies station and sitting back down at your workstation. Sometimes the thought of reaching out and asking for help can be too daunting in moments of stress, so this setup aims as providing multiple options for letting me know you need a break.

6. **Have fun!** Even when things get tough, I promise we will do our best to have fun along the way
7. **Live like Woodie.** FIRST exists because of the great Dr. Woodie Flowers, and by becoming gracious professionals and the best versions of ourselves, we can honor his incredible legacy. Compete your hearts out but always help a fellow FRC Team in need. When we win (and we are going to!) do it with grace and remember to stay humble and eager for the next challenge. Put your all into your work but remember to take care of yourself above all else. Include everyone you can and welcome all new team members with open arms, no matter their background. Lastly, embrace every mistake and use it as an opportunity to learn something new!

Shop Management Plan

FRC shops can get quite messy, so a shop management plan is key to working efficiently and safely. During the manufacturing section of the course, students will learn how to safely operate shop equipment and will receive certifications for each machine and power tool after demonstrating proficiency in operating the tool.

There will be a 5–10-minute clean-up period at the conclusion of class as needed to ensure a safe and organized shop. During this clean up period all tools should be put away, work surfaces cleaned, floors swept, and machines cleaned. If you are making a large mess during class that requires more than 5-10 minutes to properly clean, you will be expected to self-manage your time and begin cleaning your area early.

If you need specialty materials ordered for your projects, please send me an email at dclark@choate.edu. This will help you get familiar with FRC vendors and how to make a bill of materials during the build season.

Office Hours

I do dorm duty in Combination Wednesday's and Sundays from 8-11PM and will be available for extra help sessions during these hours, in addition to conference blocks. If you need extra help at a different time, please email me and we can set something up.