Choate Summer Programs – HS/MS Intermediate Robotics, Choate Rosemary Hall

Summer Term 2022

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	REDACTED

Course Description

Intermediate Robotics is a hands-on, project-based class to introduce students to more advanced concepts in robotics. During this course we will be completing a design, fabrication and mechanical assembly project inspired by the FIRST Robotics Competition (FRC) 2022 game, Rapid React. We will also be completing programming projects using SPIKE Prime robotics kits and the SPIKE Prime programming software. Students will learn core robotics skills in mechanical assembly, fabrication, wiring, Computer Aided Design (CAD) as well as programming in the Python language.

Class Meeting Times

This class meets during **Period 4:** Monday – Friday 12:50PM-2:00PM and Saturday's 11:30AM-12:30PM.

Grade Breakdown

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

The class will be divided into two main projects:

1. Manufacturing, Assembling, Wiring and Testing an FRC Mechanical Assembly
2. Programming SPIKE Prime Robots in Python

Manufacturing, Assembling, Wiring and Testing an FRC Mechanical Assembly

Students in the class will work as an Engineering Team to manufacture, assemble, wire, and test an existing assembly made by FRC 7407 members in the CAD software Onshape. The mechanical assembly includes a ball tunnel and shooter on a turret designed for use with the 2022 FRC Game – Rapid React balls, as well as modifications to an existing climber from the same game. Students will learn CNC manufacturing and 3D printing to manufacture the necessary parts for the assembly. From there, students will learn how to use mechanical and electrical tools to assemble and wire the design and iterate it as necessary based on results from assembly and testing. Students will be expected to log their progress daily via Engineering Notebook submissions.

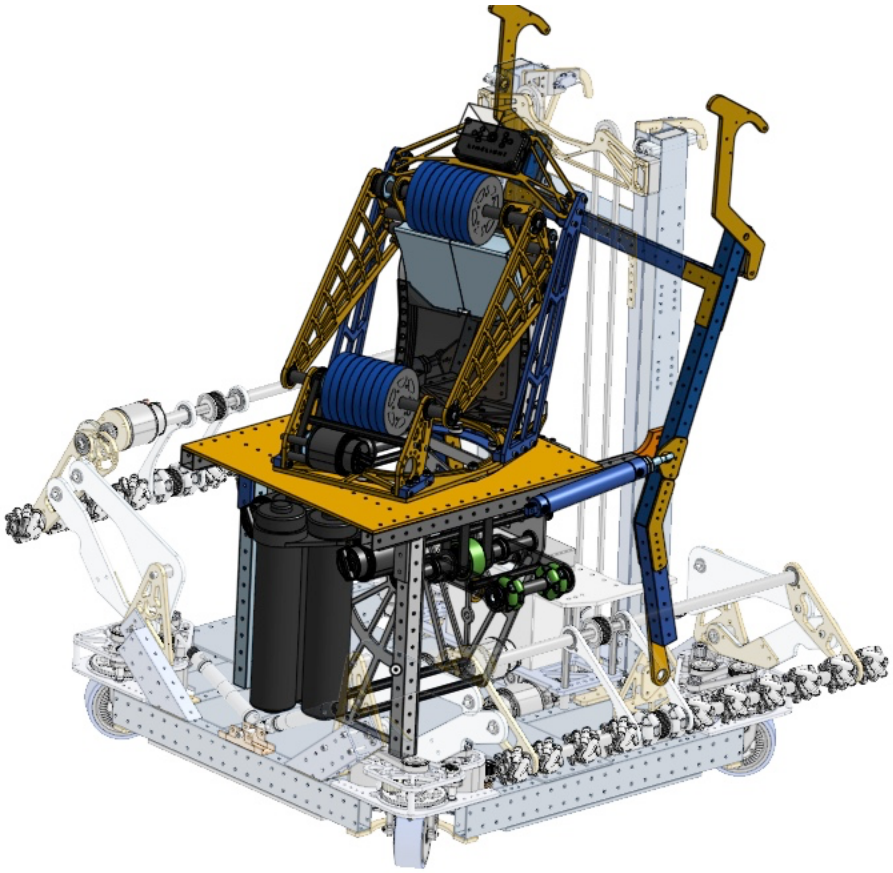

Figure 1: CAD Model of Highlighted Mechanical Assembly

Programming SPIKE Prime Robots in Python

Students will also learn Python programming using the SPIKE Prime robotics kits as well as the SPIKE software. The programming challenges will be inspired by the 2021-2022 FIRST LEGO League (FLL) Game – Cargo Connect and will be fully autonomous. Student will also learn about various sensors used in robotics, and how to implement them mechanically and in code. Lastly, students will learn CAD skills by modeling parts of their robots in Onshape.

Grading, Engineering Notebook & Homework

These projects will make up the bulk of your grade and will be completed as an Engineering Team. 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 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.

You will be expected to keep an Engineering xNotebook design log during each project. You may use a physical notebook or a digital notebook on your iPad or laptop. The following items are expected in the notebook:

- Complete an entry every time you work on the project. The last 15 minutes of each class will be dedicated to logging your work for that day. 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.
- Create a title for any idea lists or brainstorming lists you write down so an outsider reader can understand what is being communicated.

Homework assignments will consist of completing Engineering Journal entries as well as reading and reflection questions from the NASA Robotics Alliance Project Guide. Engineering journal entries will be graded out of 10 points on a weekly basis. NASA guides will be assigned on Monday's and will be due the following Monday at the beginning of class. Please refer to the assignment schedule and/or Canvas for exact deadlines.

The grading breakdown is as follows:

- **Project Work:** 75%
- **Homework/Engineering Notebook:** 25%

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.

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. **Arrive as you are, and I will meet you there.** No matter where you are each day, and even if that changes every day, I will always meet you where you are, and we will go from there. This can refer to your emotional state, energy level, headspace, technical skillset, or anything else you are feeling. Never be afraid to arrive exactly as you are in this classroom.
3. **No questions are dumb questions!** Never feel afraid to ask a question if you don't understand something or need more information.
4. **We learn together.** Everyone brings a unique perspective to the table, and we all have something to learn from one another.
5. **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.
6. **Have fun!** Even when things get tough, I promise we will do our best to have fun along the way

Extra Help

If you need extra help, please contact me over email to schedule a time to meet.