

# Mini Project: FRC 2017 Steamworks Floor Gear Intake

CS450 - ROBOTIC DESIGN &  
FABRICATION (HONORS)

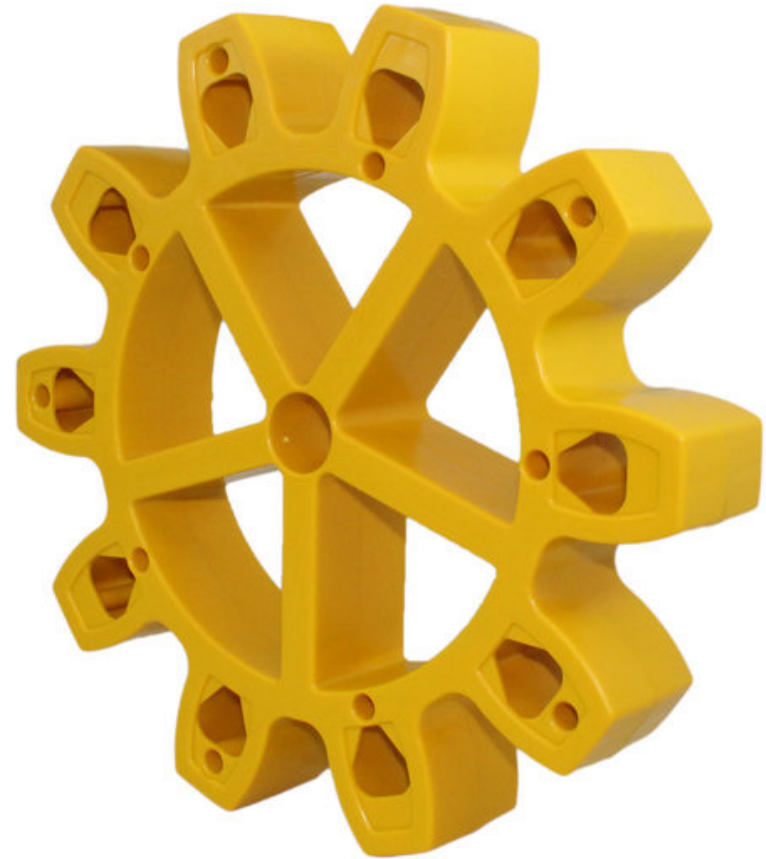
FALL TERM 2021

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# Project Overview

For the mini project this term, you will be working with a partner to design and manufacture a mechanism to collect gears from the 2017 FRC Game – Steamworks, off the ground. This project will involve the following phases:

- Background research & strategic design assessment
- CAD design in Onshape
- Manufacture design
- Assemble & test design
- Iteration (if time allows)
- Reflection Question



*FRC 2017 Steamworks Gear*

# Background Research & Strategic Design Assessment

- During this phase you will research robots from the 2017 game that had floor intakes  
[YouTube Playlist](#)   [FRC 2017 Game Manual](#)  
 Record notes and sketches from research in your Engineering Notebook
- You will also complete the Strategic and Functional Requirements spreadsheet to help shape your design to be efficient, simple and strategic

[Link to Spreadsheet](#)



Unofficial  
Cheatsheet



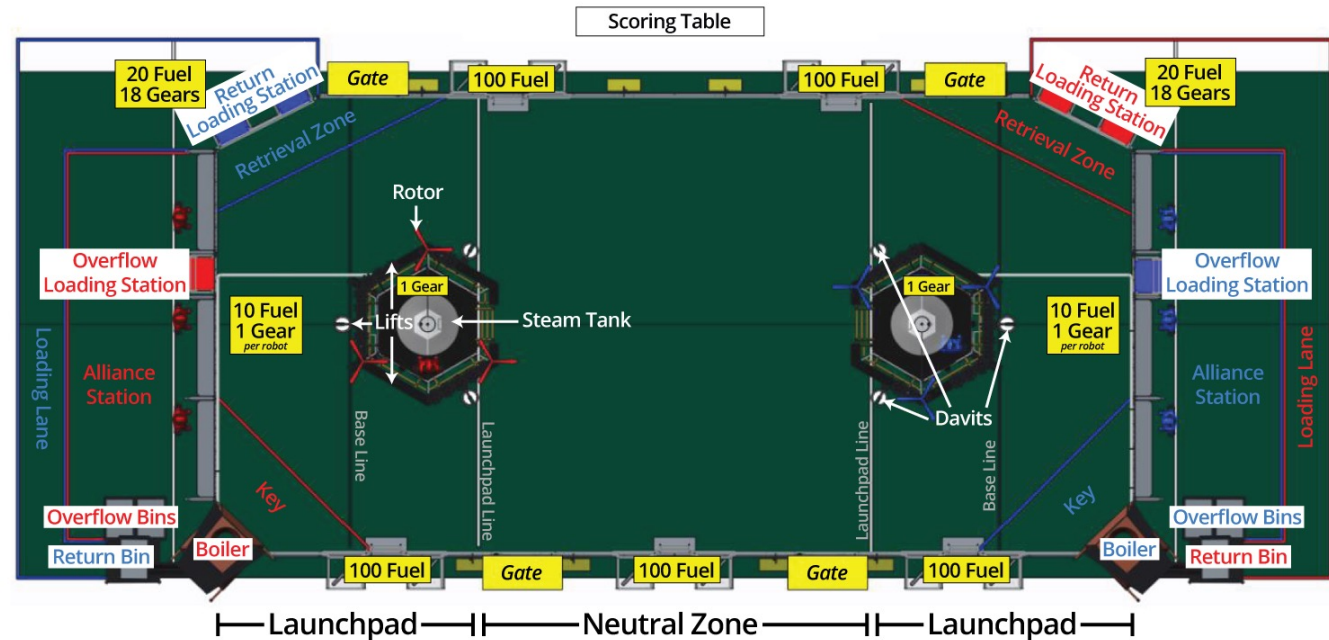
Auto		Match Points		Teleop	
Cross the baseline	5 points	3 fuel in high efficiency goal	1 point	9 fuel in low efficiency goal	1 point
1 fuel in high efficiency goal	1 point	Rotor turning	40 points	Ready for takeoff	50 points
3 fuel in low efficiency goal	1 point				
Rotor turning	60 points				

### Gear Placement

ROTOR #	1	2	3	4
Pre-populated	0	0	1	2
Pilot-placed	1	2	4	6

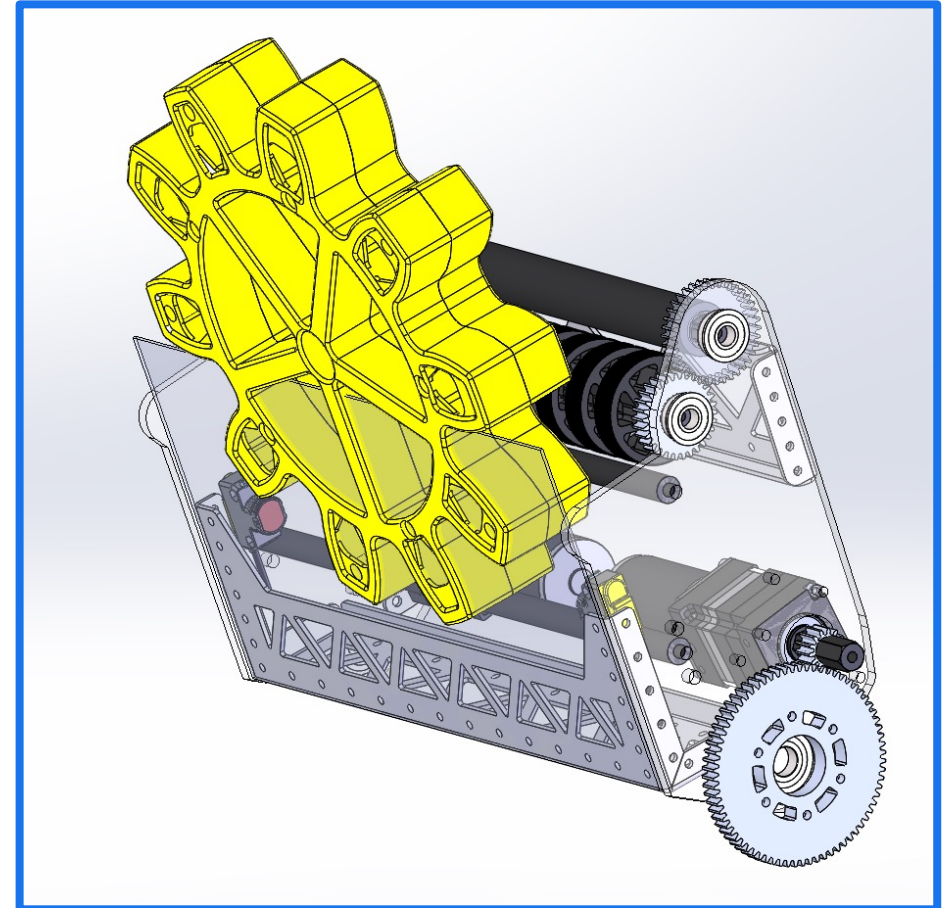
### Ranking Points

Win	2 RP
Tie	1 RP
40 kPa in Boiler	1 RP (20pts in playoffs)
All 4 rotors turning	1 RP (100pts in playoffs)



# CAD Design in Onshape

- You will use the CAD software Onshape to design your mechanism with your partner
- You should make one Onshape file with multiple part studios so you can work simultaneously
- You will create a final design assembly in your Onshape file, as well as part drawings to prepare for the manufacturing phase

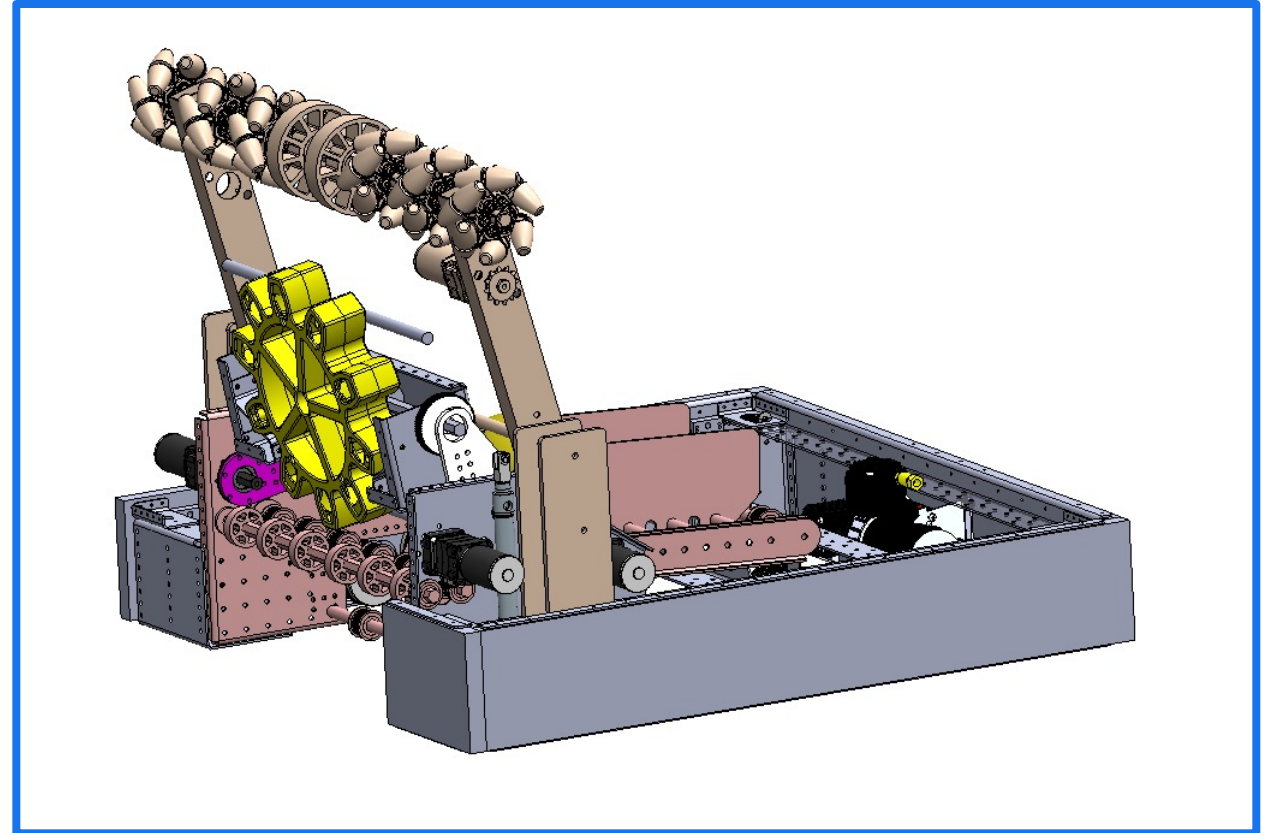


*FRC 148 Robowranglers 2017 Gear Intake Design*

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# Manufacturing

- Once your design is complete, you will manufacture your parts using tools and machines in the lab, such as the 3D Printers, Shop Bot CNC router, drill press, chop saw, etc.
- If you will need any specialty parts, please let me know ASAP so I can get them ordered

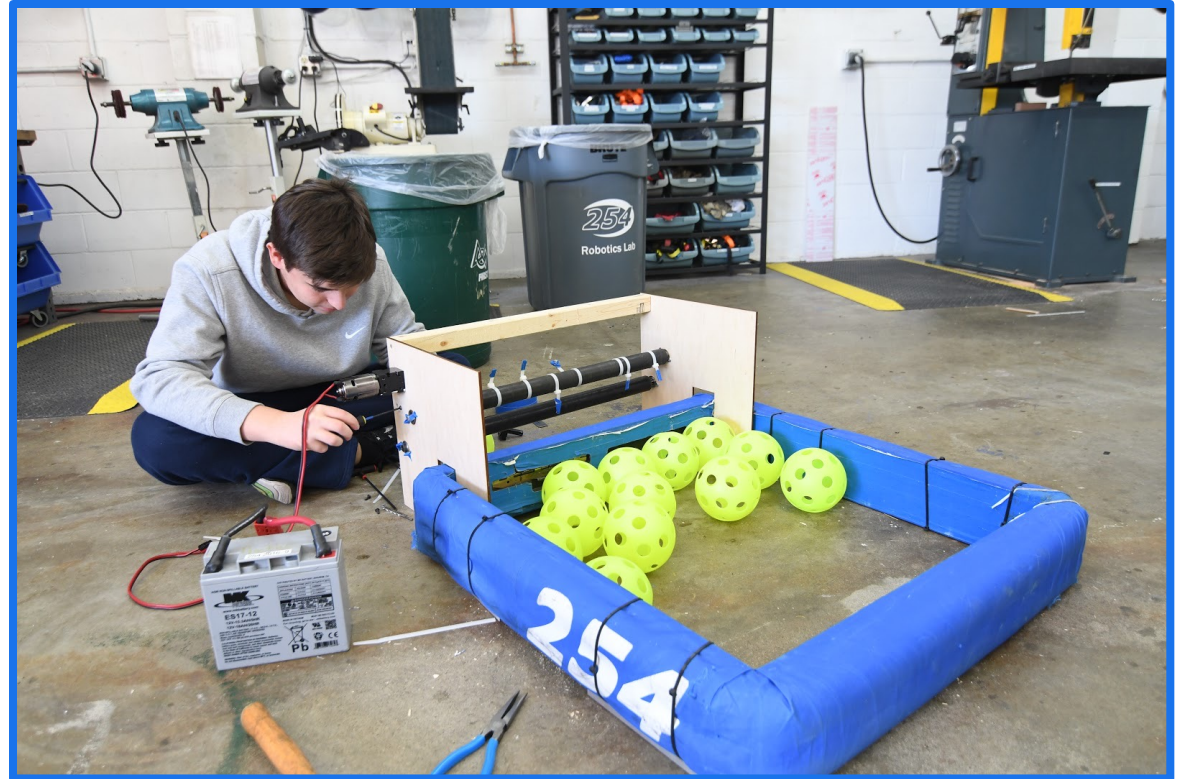


*FRC 3487 Spectrum CAD Progress 2017*

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# Assemble & Test Design

- The final step is to assemble and test your design
- You may utilize one of the existing FRC drivetrains to simulate a robot driving and picking up the gear off the floor
- You will have access to an FRC control system with working pneumatics to test your designs

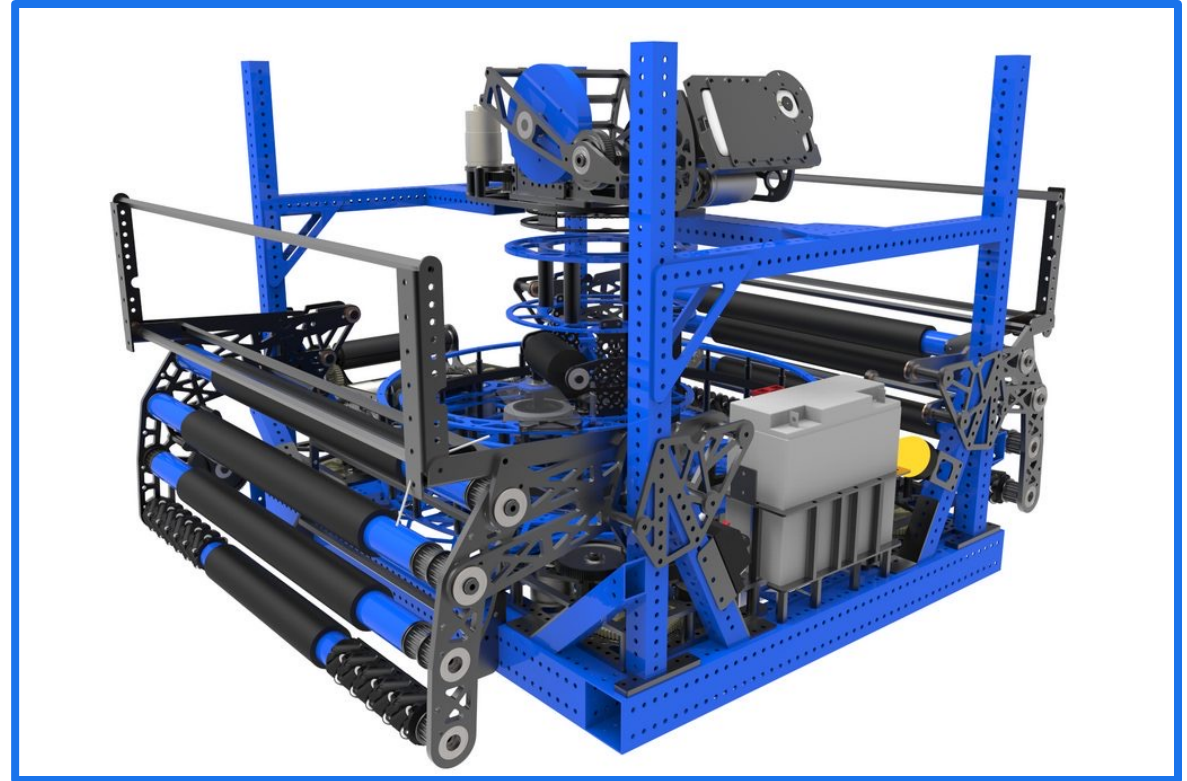


*FRC 254 Cheesy Poofs Fuel Prototype Testing*

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# Iteration

- If there is enough time, you may iterate your designs based on testing results to improve your mechanism
- We may need to move onto the final project, so iteration phase is time dependent



*FRC 1323 MadTown Robotics 2017 Robot*

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# Final Reflection Question

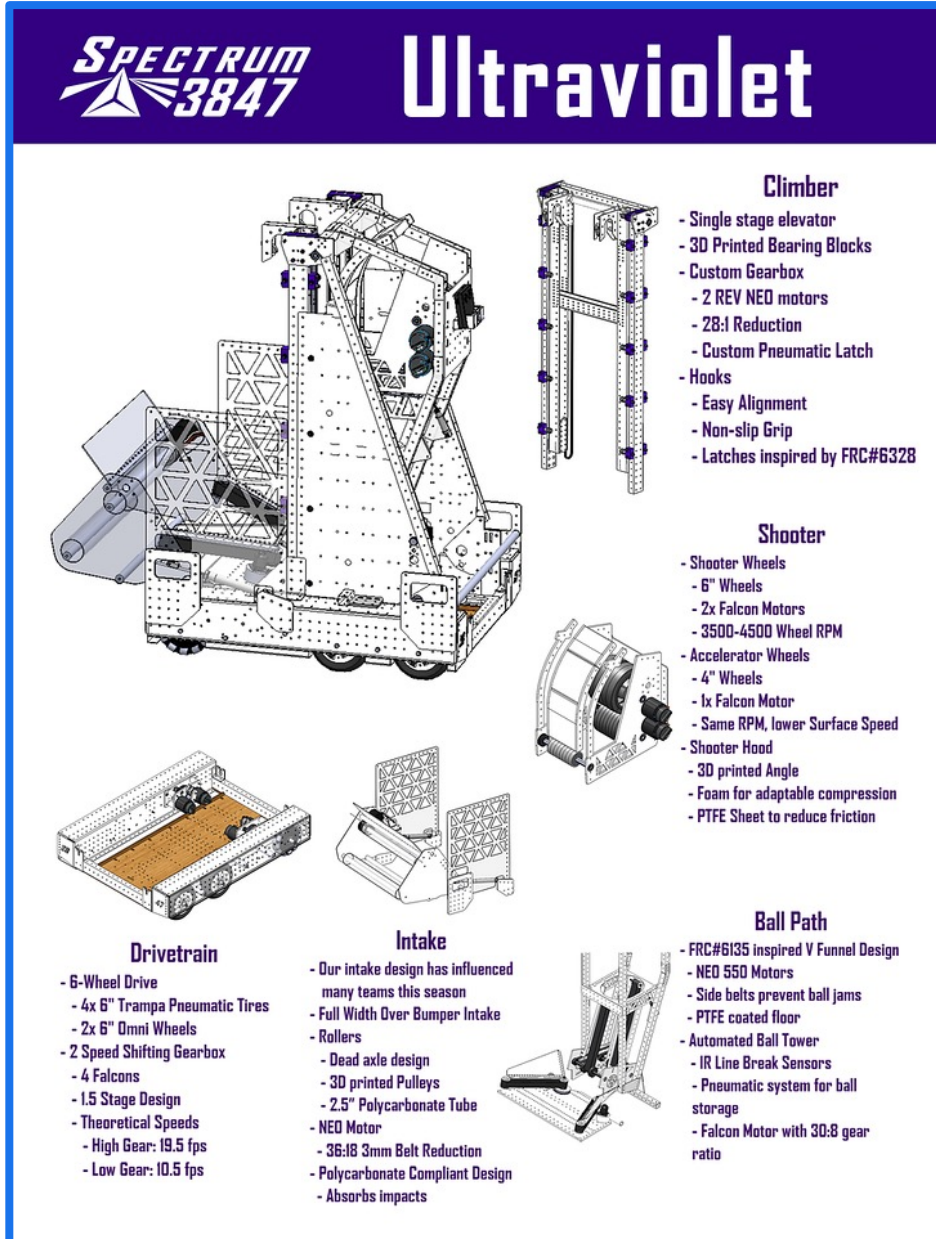
- At the completion of the project, each group should develop a written response (2-3 paragraphs) to the following question:

Do you think having a gear floor intake was a necessary design feature in FRC Steamworks to be competitive? Why or why not? If you were to design a full robot for FRC Steamworks, what would that robot look like and why?



# Deliverables & Timeline

- This project will be due October 1<sup>st</sup> in class
- On 10/1 student teams will:
  - Give a 5-minute presentation about their design and their design process. **Teams should create a physical design poster as a part of their presentation**
  - Demo their design to the class as a part of their presentation
  - Turn in their reflection question written assignment
  - Turn in their engineering notebooks (digital or physical copy)



**SPECTRUM 3847**

## Ultraviolet

### Climber

- Single stage elevator
- 3D Printed Bearing Blocks
- Custom Gearbox
- 2 REV NEO motors
- 28:1 Reduction
- Custom Pneumatic Latch
- Hooks
- Easy Alignment
- Non-slip Grip
- Latches inspired by FRC#6328

### Shooter

- Shooter Wheels
- 6" Wheels
- 2x Falcon Motors
- 3500-4500 Wheel RPM
- Accelerator Wheels
- 4" Wheels
- 1x Falcon Motor
- Same RPM, lower Surface Speed
- Shooter Hood
- 3D printed Angle
- Foam for adaptable compression
- PTFE Sheet to reduce friction

### Drivetrain

- 6-Wheel Drive
- 4x 6" Trampa Pneumatic Tires
- 2x 6" Omni Wheels
- 2 Speed Shifting Gearbox
- 4 Falcons
- 1.5 Stage Design
- Theoretical Speeds
- High Gear: 19.5 fps
- Low Gear: 10.5 fps

### Intake

- Our intake design has influenced many teams this season
- Full Width Over Bumper Intake
- Rollers
- Dead axle design
- 3D printed Pulleys
- 2.5" Polycarbonate Tube
- NEO Motor
- 36:18 3mm Belt Reduction
- Polycarbonate Compliant Design
- Absorbs impacts

### Ball Path

- FRC#6135 inspired V Funnel Design
- NEO 550 Motors
- Side belts prevent ball jams
- PTFE coated floor
- Automated Ball Tower
- IR Line Break Sensors
- Pneumatic system for ball storage
- Falcon Motor with 30:8 gear ratio