

MOE 365 FTC: 2021–2022 Season Update

Background:

[MOE 365](#) is a FIRST® Tech Challenge (FTC) robotics team community-based in Wilmington, Delaware. FIRST® is a global nonprofit focused on inspiring students to become future leaders in STEM through unique, hands-on programs. Each year, MOE students design, build, and program robots to play games released by FIRST and spread passion for innovation through community outreach. The team currently consists of 13 students in grades 8 to 12 and several adult mentors. MOE stands for Miracles of Engineering.

The [FIRST Tech Challenge](#) (FTC) is an international competition for teams of up to 15 students from grades 7-12 competing in robot games using a head to head and alliance format. These teams are challenged to program, design, build, and operate robots alongside adult coaches and mentors. Not only do students develop STEM skills and practice engineering principles, but they also learn the importance of teamwork, innovation, and sharing ideas. Along with the competition, teams are challenged to raise funds, design and market their team brand, and participate in community outreach. There are around 7,610 active FTC teams worldwide.

Nine Delaware FTC teams participated in the 2021-2022 FREIGHT FRENZY season, culminating in the Diamond State Championship on March 12, 2022.

Competition Highlights:

The Diamond State Championship was organized into two major sections, the Judging Presentation and the Robot Game. The Judging Presentation, consisting of virtual interviews between teams and volunteer judges, is used to decide the winners of each FTC judged award, such as Motivate, Think, and Inspire. Teams prepared a presentation and answered judges' questions about robot design, professional connections, and community impact.

The main scoring objective of the FREIGHT FRENZY Robot Game is for robots to collect blocks and cubes, called 'Freight,' and deliver them to multi-tiered 'shipping hubs' positioned around the field. The field is divided into 'Warehouses' and 'shipping hubs.' Robots must cross barriers in order to transport Freight from the Warehouse to the shipping hubs. Teams are able to earn points based upon the amount of Freight successfully transferred and the completion of several other tasks.

The game is also divided into three sections: *Autonomous Period*, *Driver-Controlled Period*, and *Endgame*. The match begins with a 30 second *Autonomous Period* where robots only operate with pre-programmed instructions and sensor inputs. The *Driver-Controlled Period* is the two-minute match period where drive teams operate the robots. *End Game* is the last 30 seconds of the *Driver-Controlled Periods* where teams can earn more points.

The Robot Game of the Diamond State Championship took place on March 12, 2022, at Tower Hill School with about 70 attendees. The event consisted of qualification matches followed by a knockout finals round. During qualification matches, teams were paired together randomly in alliances and two pairs faced off against each other in each match. Scores were totalled to seed teams and determine the four highest scoring teams. For the finals round, the four top scoring teams were named “alliance captains” and each invited one other team to join their alliance for the finals rounds. A bracket of the four alliances was then assembled, with each alliance pair competing in a best-of-three format to determine advancement.

MOE 365 FTC was fourth seed after the end of the qualification round and our alliance with team #18739 Insert Team Name Here finished third overall. Captain #12880 Razor Steel and their Alliance Partner #14296 Hiller Instinct were the winning alliance.

MOE 365 FTC won the Inspire Award, the highest honor at each FTC competition, qualifying for FIRST World Championships. Team #12880 Razor Steel also qualified based on outstanding performance in the Robot Game as the Captain of the Winning Alliance.



The FIRST World Championships will be held in Houston, Texas, from April 20-23, 2022. About 160 FTC teams from many countries will attend to present to judges, compete in a robot game, meet other teams, attend an Innovation Faire, and meet scholarship providers. FIRST Lego League and FIRST Robotics Competition teams will also be present at the event.

According to [FIRST](#), “The team that receives [the Inspire] award is a strong ambassador for FIRST programs and a role model FIRST team. This team is a top contender for many other judged awards and is a gracious competitor. The Inspire Award winner is an inspiration to other teams, acting with Gracious Professionalism® both on and off the playing field. This team shares their experiences, enthusiasm and knowledge with other teams, sponsors, their community, and the judges. Working as a unit, this team will have shown success in performing the task of designing and building a robot.”

Photos from the competition can be found here:

<https://drive.google.com/drive/folders/1o7Zvw816u87Z669rTPoO-l-9YtzZkmwS?usp=sharing>

MOE Engineering Highlights:

Students followed engineering design principles to build and program a robot for this year's game, FREIGHT FRENZY.

MOE students worked with mentors to brainstorm ideas, construct prototypes, make computer aided design (CAD) models, and construct the finished robot.



Our student-made computer aided design (CAD) model of our robot.

MOE students also programmed the robot to detect the position of a 'Team Shipping Element,' a small object placed on the field. They use Open Computer Vision to drive along pre-programmed Autonomous routes, along with alerting drivers when blocks or cubes have entered the robot via signals on the controllers.



2 views of our completed robot.

To see our robot in action, watch our student-made Robot Reveal Trailer here:
<https://youtu.be/VuB6PP33oqs>

MOE Outreach Highlights:

MOE students have met 330 kids and parents at **7 in-person events** this year, including:

- Opening of the Wilmington Teen Warehouse (8/5/21)
- STEM Night at the Blue Rocks (8/26/21)
- Summer Camp, Halloween, and Science Saturday at Hagley Museum



Teaching kids to drive our robot

at Halloween at Hagley.

MOE students have connected with the **STEM and FIRST community** by:

- Hosting 3 virtual workshops for local FTC teams covering FTC programming, judging, and documentation
- Participating in the XEO Challenge by designing an ocean cleanup robot in collaboration with Team Alpha Lab from Quebec.
- Connecting with a total of 25 FTC teams via email, social media, and virtual events.



MOE students presenting to a new team about the basics of FTC programming.

Additional Outreach highlights:

- Started and mentored a **new FTC team, #19889 Robo-Sapiens**, by recruiting students and providing funding, meeting spaces, mechanical parts, and continued support.
- Donated the equivalent of 700+ meals to the **Food Bank of Delaware** through a donation drive and fundraiser at Chipotle Mexican Grill.

MOE students showing future members of #19889 Robo-Sapiens how to drive an FTC robot.



Additional Information

MOE 365 FTC is sponsored by the following organizations and would like to graciously thank all sponsors for their mentorship and support. MOE's parent organization is [FIRST State Robotics](https://www.firstinspires.org/).



More information about MOE 365 FTC can be found on our website, www.moefrc.org.

MOE 365 FTC's student-created Engineering Portfolio, a 15 page summary of our team's journey, can be found at www.moefrc.org/notebook.

More information about the FIRST program can be found at www.firstinspires.org.

MOE 365 FTC can be contacted via email at moe365.ftc@gmail.com.