FIRST®

Mentor Handbook

COUGARS GONE WIRED

FIRST Robotics

What is FIRST?

FIRST (For the Inspiration and Recognition of Science and Technology) is an international organization dedicated to getting the younger generation involved and inspired for STEM. Founded by Dean Kamen in 1992, FIRST has grown from 28 teams in a single state to four different divisions with over 44,000 teams all around the world.

FIRST is built around the idea of gracious professionalism, where teams' primary focuses are to work with and help each other, rather than simply compete. Teams are expected to provide assistance to others in all aspects when needed, and older teams often mentor and help rookie teams get on their feet.

FRC

FIRST Robotics Challenge, or FRC, is the highest division, targeted towards high schoolers. Dubbed by FIRST as "the hardest fun you'll ever have," FRC requires tons of resources all of which the students and team must gain themselves, generally via corporate sponsors. On the first or second Saturday of January, an international broadcast is released containing the year's challenge. FRC Teams must design, prototype, build, and program a robot to play the game. Each game is played by two alliances of three FRC Teams each. Outside of build season, FRC teams can also participate in different community or international outreach events to help spread STEM and FIRST.

FTC

FIRST Tech Challenge, or FTC, is targeted towards middle and high schoolers. It is less time consuming and resource intensive than FRC, with a 5 month build season and much smaller robot. The challenge for each year is released in September.

FLL

FIRST LEGO League, or FLL, is targeted towards middle schoolers. It uses LEGO Mindstorms as a platform for robot design and also requires research and a presentation on a real-world problem.

Jr. FLL

First Lego League JR. is targeted towards elementary schoolers. It uses LEGOS and the theme from FLL to teach kids about simple machines. They all must design a solution to a challenge given each year out of legos with one motorized piece. Jr. FLL does not compete, and instead all the elementary school teams' design solutions are displayed at showcases and expos.

Awards

Different awards outside of winning the competition via robot are also offered by FIRST.

The Chairman's Award is the most prestigious award in FIRST, recognizing FRC teams that go above and beyond in spreading the message of FIRST and STEM. Chairman's Award winning teams generally participate heavily in community and international outreach events, start other FIRST teams in all divisions, and show gracious professionalism.

Dean's List is an award for outstanding sophomore or junior students on FRC and FTC teams. Mentors are in charge of submitting two students on their team by writing an essay, no more than 4,000 characters, about how the student demonstrates leadership, passion and overall contributes to his or her team and FIRST. The selected students must then interview at regional competitions, and then have a chance to compete for it internationally.

Woodie Flowers is an award for FRC mentors. Students can submit a 3,000 character essay about an outstanding mentor on their team each year about how the mentor has shown them to think and act like an engineer, and how they have overall contributed to their team and FIRST.

The Mentor's Role

Mentors are needed for FRC teams. They're the engineering experience that the students don't yet have, the guides to turn to when a problem seems unsolvable, and the role models for the students. They're the men and women who the students one day aim to be.

Mentor Do's

- ★ **Get to know the students you're working with!** It makes it easier for them to ask them for help and easier for you to intervene when you need to.
- ★ **Listen to the students' ideas**. It's incredibly frustrating when our ideas are overlooked in favor of mentor presented ones simply because we have less experience. Even when student ideas may seem silly or difficult, more is learned through us trying and failing than through ideas being immediately shot down.
- ★ **Teach students how to do a task and encourage them to then teach others.** Promote student leadership as much as you can-this is one of the biggest things FIRST is about. Make sure that students are developing leadership and communication skills.
- ★ **Acknowledge when students do something right.** It can be a discouraging process for a lot of students to learn to do all of the skills robotics requires, especially since most are coming in with little to no prior experience. Accomplishments, even small ones, being noticed by mentors can mean a lot and provide a lot more encouragement than you'd think.
- ★ **Understand that the students are still in high school and they have a lot of school drama and stress.** Encourage them to keep their problems outside the workshop and make robotics a place of focus, but sometimes the stress of their schoolwork, home situations, or other issues can catch up to them. Be supportive and able to listen; you

Mentor Dont's

- ★ **Don't do a project for the student.** Let them do the work themselves and learn. Just be there to provide guidance, answer questions and make sure they stay safe.
- ★ **Don't put your ideas before those of the students.** FIRST is about teaching students brainstorming skills. Pitch in ideas when things are slow to help them get thinking again, but make sure the design is the students'.
- ★ **Don't be too harsh on students making mistakes.** It takes time to learn all the skills required and if the student hasn't intentionally damaged something or put themselves at risk, try to explain to them why it's wrong and a better way to do it instead of immediately punishing them.
- ★ **Don't let drama interfere too much with their work.** FRC students are still in high school and while sometimes they need someone to listen to their problems, some altercations can continuously interfere with their work and cause more issues during robotics. During this time, mentors can be needed to step in and either separate the students with an issue or encourage them to maturely work through their problem until it no longer interferes with their work.
- ★ **Don't let students fail to the point where it permanently discourages them.** Let students go through trial and error as much as is needed, but don't allow them to set themselves up for failure on something huge and time-consuming. If it looks like someone is about to do something

don't need a solution to all of their problems.

- ★ **Be there as much as you can.** It's easier for students to get to know mentors and vice versa if mentors are present.
- ★ **If you see a student struggling, help them.** Don't overwhelm them and take over their task, but try to guide them through their problem and show them how to use the equipment required if needed. Sometimes it can be difficult for students, especially new ones, to ask for help, and a little bit of advice can help out a lot.

highly regrettable, encourage them to think through the task once more and guide them to a better solution.

- ★ **Don't be pessimistic.** Students look to mentors for cues on how to act in lots of situations, and in the situation of falling behind schedule, breaking tools, or anything else, students will already be feeling down. Staying positive will encourage students to do the same.

Always remember, as part of a FIRST team, mentors, along with the students, are ambassadors for the organization of FIRST. They are expected to exhibit the same traits the students are, such as gracious professionalism and coopertition, and whenever they are with the team, ensure that their actions reflect on the entirety of the organization.

Team Structure

Teams are structured differently depending on their history, mentors, and number of members. Many are set up with different subteams for different aspects of robot-building; one team for programming, one for electronics, one for mobility, and so on. Others with fewer students require everyone to participate in everything.

FRC Timeline

FRC team timelines vary from team to team, depending on what community events they participate in, how they build their robot and how they train new members.

Summer/Pre-Build Season

Many FRC teams dedicate their off-season to community demonstrations, outreach programs and training new team members. Mentors are often expected to be present at these events, and depending on team set-up and structure, they may be needed to help organize and run them as well. Before build season starts is the best time to get to know the team and learn and understand how the team is structured.

Build Season

Build season is the time when mentors are needed the most. From kick-off to Bag & Tag, students only have 6 weeks to strategize, design, prototype, build, test, program and modify their robot. Students will need mentors to assist them, but not control, in initial brainstorming, help them work on the robot and show them how to use power tools, and ensure that everyone is using machinery properly and safely. Build season hours can get long. Many teams meet every day of the week, some also on Saturdays. Good mentors show up as much as they can and work with the students to teach them how to approach all situations throughout build season like engineers.

Competition

Competition is the final piece of robotics, where the team finally has the opportunity to put all their hard work into action. Competition starts out with teams setting up their pits, a small 10 ft. by 10 ft. workspace where their robot is housed throughout competition. No more than five people should be in the pit at a time, and one person present has to be the “Safety Captain.” Safety glasses must be worn in pit areas at all times.

After that comes the matches. Teams will be scheduled for different qualification matches throughout the day on randomly assigned alliances that change each match. How matches are scored and how teams are ranked will vary with each game. At the end of qualification matches, the top eight seeded teams will select what other teams they want on their alliance for the final matches. Whichever alliance wins the final matches will have the opportunity to go to Championships.

During the match, there can be two student drivers, a student human player, and either a student or mentor coach to drive the robot itself. Coaches are in charge of guiding the drivers on what to do with the robot and communicating with the other teams and human players on the alliance to ensure the match flows smoothly and follows strategy.

Mentors, during competitions, can sometimes need to be chaperones for students, assist in quickly fixing the robot between matches, and help out other teams. Gracious professionalism is especially important at competition as well, so always be as courteous as possible to other teams and stay positive and humble. However, competition is a time to have fun and enjoy the hard work everyone has put in so far, so mentors should take the time to watch some of the matches and see some of the pits.