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# Starting A Team

## Registering

A document describing the process of starting a team:

<https://www.firstinspires.org/sites/default/files/uploads/resource_library/flc-startteam-fc001.pdf>

FLL’s guide for coaches to register a team

<https://www.firstinspires.org/robotics/fll/start-a-team>

## What does an FLL Team Do?

FLL teams are a group of students who work with coaches to learn and share together. Specifically, they build and code a robot and use it to solve mechanical missions on an FLL table. At a competition the students run their robot on a competition table and try to score as many points as they can. They also create an Innovation Project which they present to the judges at the competition. The Innovation Project is an important opportunity for your team to do a project about an innovative solution that they come up with that addresses a problem in their community. At competitions, the students also present to the judges about the progress of their robot design. While they do all this work, the students learn to work with each other, and other teams, using Core Values, which are values describing how each person on the team should act.

FIRST does an excellent job introducing teams to the four aspects of FIRST Lego League, Robot Game, Innovation Project, Robot Design and Core Values, in the Challenge Overview document. The Challenge Overview document is the first link in this helpful resource page.

​​<https://www.firstinspires.org/resource-library/fll/challenge/challenge-and-resources>

We suggest that coaches begin by reading the Challenge Overview document in order to learn what teams are expected to do. We also suggest that you read the Welcome Letter, found as the link above.

## **Resources**

### FLL Central Library of Official Team Resources

Rulebook, Rubrics, Mission Model Instructions, Table Building Instructions

<https://www.firstinspires.org/resource-library/fll/challenge/challenge-and-resources>

FLL Central Library of Official Judging Resources

<https://www.firstinspires.org/resource-library/fll/challenge/volunteer-resources>

The Rubrics

<https://firstinspiresst01.blob.core.windows.net/first-energize/fll-challenge/fll-challenge-superpowered-connect-rubrics-2022-23-greyscale.pdf>

The rubrics are some of the most important documents to read. The judges use them to score your team during judging sessions. Print out the rubrics and show them to your team. Using rubrics you can see how to do better in judging by making sure to design your presentations to increase your score. You should use the rubrics throughout the season to guide your work.

Programming Resources and Robot Design

The Seshan Brothers have created programming lessons and robot directions for Spike Prime. Their work is excellent and free.

<https://primelessons.org/en/>

Lego has also created an excellent curriculum that guides teams through the process of building and coding a robot:

<https://education.lego.com/en-us/lessons/prime-competition-ready>

Innovation Project Resources

The Seshan brothers have also created a set of tutorials for the Innovation Project, Core Values, and Robot Game. Again, their work is excellent.

<https://flltutorials.com/en/>

How to build a FLL competition table where you put your competition mat and mission models:

[table-build.pdf (firstinspires.org)](https://www.firstinspires.org/sites/default/files/uploads/resource_library/fll/table-build.pdf)

# The Robot Game:

One of the most important aspects of FLL is the Robot Game. Twenty-five percent of your score at a competition comes from your team’s performance solving Missions on the Robot Feild. An additional twenty-five percent of your score comes from your performance during Robot Design Judging.

In order to do well in both these aspects of FLL your team will need to learn to build and code robots, then adapt what they have learned to build and code a robot for this year’s field.

First, your team needs to know what this year’s game is. We suggest watching [this video](https://youtu.be/ILTjo0LHZQA), made by FLL, that lays out the missions the robot needs to accomplish and some of the rules about what the robot can and can’t do as it solves those missions. A more detailed set of rules about the missions is in the [Robot Game Rulebook](https://firstinspiresst01.blob.core.windows.net/first-energize/fll-challenge/fll-challenge-superpowered-robot-game-rulebook.pdf), which the kids should read once they are ready to do so.

When my team first began I needed to teach them to build a basic robot and then teach them how to code it. Below are links to two excellent curricula that are designed to do this.

## Learning to Build and Code a Robot:

There are several curricula that already exist that guide FLL teams through the process of learning to build and code a robot.

One of the best resources for building and programming FLL robots using the Spike Prime set comes from the Seshan brothers. They offer a complete set of coding instructions and robot designs. We highly recommend them.

<https://primelessons.org/en/>

Another excellent curriculum that guides teachers through helping their FLL team build a code and FLL Robot comes from LEGO:

<https://education.lego.com/en-us/lessons/prime-competition-ready>

## Making the Robot and Code Your Own:

One thing that sets more advanced FLL teams apart is the degree to which they design their own FLL robot. After your teams have learned to build and code using one of the curricula listed above, we recommend that they design, build and code their own robot.

We have also built our own designs using our own ideas of what works best.

Basic Robot Building Instructions:

<https://drive.google.com/file/d/15cZP67jICnpMcQKc4WjWVNzpoVepPZqc/view?usp=sharing>

More Advanced Robot Instructions:

<https://drive.google.com/file/d/1J2fTdZ0jQDVxN0tEbN4fghBh_CDEsyEG/view?usp=sharing>

Build Plate for Advanced Robot:

<https://drive.google.com/file/d/1mpvtflo37957uFttt3tSXQNNUD6X-wvR/view?usp=sharing>

Video on what makes for a good robot:

<https://youtu.be/9DzS0jlQDBM>

The video linked above was made by our main robot designer, Owen, a few years ago. It captures much of what we learned about robot design over the years we did FLL. Owen was using a different robot set than you will be using. You will be using a Spike Prime robot set. He was using an older robot set called EV3. Despite these differences, what he says in the video is still true today. I suggest studying the video.

Recently some teams have adapted the video that Owen made for the SPIKE Prime. Here is an excellent example of such a video:

<https://youtu.be/T5eY1hJghII>

We recently put together a new robot design that is linked above that captures what he was saying about robot design but uses the Spike Prime system. This robot is called the Advanced Robot. It was made with a kit that contains 4 medium motors. If you use a Spike Prime and an Expansion Set for the Spike Prime, you will have 2 medium motors and 2 large motors. You can design something like the Advanced Robot for yourselves that allows you to compete well.

Here is a link to some pictures of a finished Advanced Robot with a Build Plate.

<https://drive.google.com/drive/folders/1YGbLJ918TxCTP72xihB8TqOzWi5ikFxf?usp=sharing>

You might wonder what the Build Plate is for. It is designed to allow you to build mechanical attachments that you can quickly mount, and unmount, from the robot. If you watch the robot design video, (linked above) you will see how this works. A robot game only lasts for 150 seconds, so you want to be able to have your robot launch from the Launch Area, drive to a series of mission models where the robot performs the scoring tasks, and then drive home again, all in a few seconds. Then, the build plate can be taken off the robot, and a new one that can accomplish a new set of missions can be put on, and the robot is then relaunched. If you watch this video, you will see how this works.

<https://youtu.be/sL2OpNeqVSo>

This is a video we made of our robot game near the end of the City Shaper season. It shows the robot leaving the launch area, solving missions, returning to home, having its attachment changed, and then being relaunched to solve the next set of missions. One way to make effective robots is to use this approach.

If you look at the pictures of the Advanced Robot, you will see some key features. First, you will see that the wires are all tucked inside the robot. This is so that the robot is small and does not have any wires that can get caught on things. Also, this makes the overall profile of the robot flat sided so that it can back against the field walls and so square itself up on the walls. As you build your robot we advise you to hide your wires inside the robot so that they don’t get in the way. Be sure to run them through the robot in such a way that they don’t rub on the wheels at all. If they rub on the wheels, the robot will not drive well.

## Solving Super Powered Missions:

As you build and code your own robot, you may want help in coming up with ideas for how to solve the missions on this year’s board. Some teams have already put up videos laying out their solutions to this year’s board. As time goes on, more and more teams will put up videos. We will put them here as we find them.

Here is a very cool video that Amelia found showing full solutions to this year’s board:

<https://youtu.be/ILTjo0LHZQA>

Working together, your team can come up with a great Robot Game. As you work on the game refer to the Robot Game Rulebook for detailed rules on how to get points from each mission. The Robot Game Rulebook can be found here:

<https://firstinspiresst01.blob.core.windows.net/first-energize/fll-challenge/fll-challenge-superpowered-robot-game-rulebook.pdf>

Also, be aware the official referees sometimes come out with clarifications of rules. These rule updates can be found here:

<https://firstinspiresst01.blob.core.windows.net/season/challenge-updates.pdf>

One of the most fun aspects of FLL is figuring out quick, reliable, methods of scoring the points from as many missions as you can. Watching the videos that other teams put out is a great source of ideas for how to solve them.

## Robot Design Presentation

Part of your time with the judges is a five minute time period in which the team gets to explain to the judges their robot design. Teams are not required to have a scripted presentation, but we recommend it. As with other aspects of judging, the best approach to developing this presentation is to read the [rubric](https://firstinspiresst01.blob.core.windows.net/first-energize/fll-challenge/fll-challenge-superpowered-connect-rubrics-2022-23-greyscale.pdf) for that section of judging and then write a script that directly addresses the rubric. So, for example, one of the lines in the Robot Design Rubric is titled Iterate. It reads, “– Team repeatedly tested their robot and code to identify areas for improvement and incorporated the findings into their current solution.” To address this section of the rubric we recommend that your team present images of successive attachments, or mechanisms, that they developed to address some of the missions. As they show these images, they would describe why they moved from one design to the next. It is helpful to be able to cite basic statistics such as the speed with which the mission can be scored and the repeatability of the scoring. So, for example, the team members might say. “Here is a picture of our first attachment designed to pick up the Energy Units in the Solar Farm mission. We ran it ten times and found it could only pick up all three units 4 of the 10 runs. So, we redesigned it with a wider opening and tested it again. The second version picked up all three units 6 times out of 10. We redesigned it again with a better door, tested it again and found that it picked up all three units 8 times out of 10.” Also, during Robot Desing judging, it is a good idea to focus the judges on any parts of the robot that the kids are particularly proud of. They should say why they are proud of them. Emphasize anything unique and excellent about the robot or its code.

The key is to show the judges that you meet all aspects of the rubric through showing the images, or the actual robot, or a laptop screen (with short videos if possible), and talk them through the team’s work. Personally, I think that this is the most fun aspect of judging. Make sure each child is given a role in the script. Make sure to take good pictures as you develop the robot, its attachments, and the code. Also, keep these images and notes on the results of tests organized and easy to find. As you get closer to the competition, have the team work on writing the script, choosing what they are going to show, and in what order. Help them address all aspects of the rubric.

The team only gets five minutes to present, so they need to practice the script. However, they will also answer questions for five minutes, so it’s a good idea to practice giving additional examples that support the presentation. Again, each child should speak during the question period. The children should demonstrate good Core Values throughout, listening to each other, the judges, and not interrupting, but also not talking the entire time.

The judges are interested both in the progress of the robot’s mechanisms and design, but also in the progress of the code. It is a good idea to be able to show the judges the code and discuss how it has improved over time and any important innovations that the team has made. If you use Spike Prime, then you will want to present the Mybloks that you create, how they work, and why you use them.

## Tips for the Board - Mechanical

# Innovation Project

What is the Innovation Project? FIRST has created a good introduction to the Innovation Project in the [Challenge Overview](https://firstinspiresst01.blob.core.windows.net/first-energize/fll-challenge/fll-challenge-superpowered-overview.pdf) document that can be found at the top of [resources](https://www.firstinspires.org/resource-library/fll/challenge/challenge-and-resources) page.

We suggest using the Seshan brothers tutorials about the Innovation Project as you develop your innovation project. Click on the [link](https://flltutorials.com/en/) and then click on the Innovation Project Link. We recently looked over all the tutorials. All of them are good, but two of them don’t apply any more. Ignore the tutorials on the Global Innovation Award (unless you want to apply for the Global Innovation Award) and the STEAM City Challenge. As you look at the tutorials, please keep in mind that the rubrics are slightly different this season. Read the tutorials, but use this year’s [rubrics](https://www.firstinspires.org/resource-library/fll/challenge/challenge-and-resources?utm_source=first-inspires&utm_medium=fll-game-season&utm_campaign=flc-registration-022).

<https://flltutorials.com/en/>

The Innovation Project takes quite a bit of work and is a major aspect of participating in FLL.

# Core Values

We suggest using the Seshan brothers tutorials about Core Values. They are excellent.

<https://flltutorials.com/en/>

Also, we have gathered together some core values activities that are designed to help teams to learn to work together and to practice core values. This document is a set of notes on how to run these core values exercises. When we were an FLL team, we would run one of these exercises every few practices and then talk about what worked and what did not work. We often reviewed the core values rubric as we discussed how we did during an exercise.

<https://docs.google.com/document/d/1Y2JUnHPfB1ZlkUMQD57Fvb6IMzxDpSSGx-aYoF4M9AI/edit?usp=sharing>

Keep in mind that what the judges want to see is that your team is cooperative, kind, enjoys each other’s company, and acts in a thoughtful manner. The judges want to see each child speak and be heard. Interrupting each other is not good. Each child should offer ideas and each should be heard by the others.

THe judges also want to see that each team has its own personality and spirit, both in judging, and at other times during the competition. So, for example, many teams create their own outfits, shirts, or hats, that capture something they are proud of about themselves. I have seen some teams walk around competitions singing their team’s song, waving banners for each other, and celebrating other team’s work.

# Competition Overview

Competition schedules vary from region to region in the world. In most regions teams prepare for a qualifying competition and then a regional competition. Teams that qualify at the qualifying competition get the right to move on and compete in the regional competition. How this is handled and the dates of the competitions, will depend on whichever organization is sponsoring FLL in your region.

The main task of a team is to prepare for and then compete in an FLL competition. Of course, so much of the learning and the joy comes in preparing for the competition, but the formal reason for the team is to attend a competition. At a competition teams take on two major activities. They attend a judging session (described at this [link](https://firstinspiresst01.blob.core.windows.net/first-energize/fll-challenge/fll-challenge-superpowered-judging-session-flowchart.pdf)) and they compete in the Robot Game, which is well described in this [video](https://youtu.be/ILTjo0LHZQA). Each team will get to run multiple Robot Games and only their top score will count towards their overall performance.

## Preparing for the competition

FLL prepared this video about preparing for competition.

<https://youtu.be/gO6uV4Ark0w>

Preparing for the competition means creating a strong Innovation Project and coding and building a robot to accomplish as many of the missions as possible in the Robot Game, all while practicing good Core Values.

As the competition date gets nearer, it is important to begin to organize presentations of the Innovation Project and the Robot Design. To do this, have the teams read the rubrics over and think about what they can say and show in their presentations that will help the judges to understand their work and get them the best score possible.

The students will likely want to write scripts for both presentations. They may also want to select important images, or, if possible, video clips, to show to the judges that help them demonstrate their work.

The judges generally keep strict time and so it is important to make the scripts a realistic length and to practice them. Each student should speak. Also, it is a good idea to prepare them for the judges questions and to review with them the judges scripts. Many of the judges’ questions, and the official script that judges are advised to follow, are publicly available to teams, and judges, here.

<https://www.firstinspires.org/resource-library/fll/challenge/volunteer-resources>

To help the kids prepare for competitions, I would pretend to be the judges. They would walk into the room, present their presentations and then I would ask them questions. Afterwards we would talk about what worked and what did not work. We would make sure that everyone spoke during both the scripted part of the judging and the quotation and answer part. We would talk about how well the kids had answered the questions and what else they might say. We would comment on big ideas or facts that they might want to include. We even practiced turning a question so that the students would know how to include the team’s best material into their answers. We also made sure that no one spoke too long. With only five minutes to answer questions, it’s important to have short answers that pull in the best material the students have. We also worked on making sure the kids addressed the rubrics. We even practiced using certain words that are in the rubric to help the judges to see why our answers met the rubric’s criteria.

Another important part of preparing for the competition is practicing the robot game. This season each team is permitted to have four technicians up at the field, and to switch in technicians from the team. As you get closer to the competition, it is important to practice the robot game many times so that each person knows what they are supposed to do. After each game they should talk about what worked and what did not work and then try it again. It is not necessary that each member of the team be a technician at the field. Working out who should take on what roles is something that you need to supervise as you practice for the competition.

## The Day Before the Competition

The day before the competition you want to make sure that you have the team outfits, scripts, presentation props or slideshows, the robot, the robot charger and spare parts for the robot. It is a good idea to put the robot into a protected box. At our competitions we had the robot and its attachments on a cart that we wheeled to the table. If this is not practical for you, we suggest that you bring the robot and its attachments in a box up to the table. We also had the luxury of having a laptop computer that we could bring to competitions that had all the robot code on it. Make sure that the correct code is downloaded onto the robot and is ready to run. Also make sure the robot is fully charged before going to the competition.

Many teams stop making code changes to the robot game a couple of days before the competition just to make sure that they don’t break something right at the end.

## Day of the competition

At the competition you will go to one judging session, described in the [flowchart](https://firstinspiresst01.blob.core.windows.net/first-energize/fll-challenge/fll-challenge-superpowered-judging-session-flowchart.pdf), and a set of robot games.

The main goal is for the kids to have a fun time and show what they know, have learned and what they can do. To help them with that, the best thing to do is to be prepared in advance and then help them focus on the positive things that have happened.

### Judging

Flowchart - What judging will look like at your competition

<https://firstinspiresst01.blob.core.windows.net/first-energize/fll-challenge/fll-challenge-superpowered-judging-session-flowchart.pdf>