

# *LEGO®* *MINDSTORMS®* *COMPETITIONS*

*FIRST LEGO LEAGUE and WORLD ROBOT OLYMPIAD*



**FIRST  
LEGO®  
LEAGUE**



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	 FIRST LEGO LEAGUE	 WRO™ World Robot Olympiad
<b>Cost*</b>	US\$225 national registration, US\$75 challenge materials, US\$150-\$200 local	US\$150 national registration, US\$80 challenge mat, US\$150 local
<b>Website</b>	<a href="http://www.firstlegoleague.org">www.firstlegoleague.org</a>	<a href="http://www.wroboto.org">http://www.wroboto.org</a>
<b>Participants</b>	29,000 teams worldwide	22,000+ teams worldwide
<b>Age*</b>	9-14 (North America) 9-16 (Elsewhere)	Under 12 (Elementary) 13-15 (Junior High) 16-19 (Senior High) 10-19 (Football)
<b>Requirements</b>	Students <b>must</b> complete all three components: Robot, Project, Core Values	Students <b>select</b> between Regular category, Open category, or Football
<b>No. of Members*</b>	2-10	2-3
<b>Robots</b>	LEGO MINDSTORMS and LEGO elements only  Autonomous	NXT, EV3, LEGO elements and HiTechnic Color, IRSeeker, Compass sensors  Autonomous
<b>Season Dates</b>	September-January	January-September  Can participate via video

- Note: There is regional variation for costs and requirements (age/number of team members) in FIRST LEGO League. All cost numbers are approximate. Check with your local organizer for more accurate and up-to-date numbers

	 <b>FIRST LEGO LEAGUE</b>	<b>Robot Game</b>	 <b>WRO™</b> World Robot Olympiad	<b>Regular Category</b>
<b>Robot Design</b>	<ul style="list-style-type: none"> <li>Robot typically consists of a base/chassis with multiple attachments which can be added/removed in the base area during the game</li> <li>Robot is pre-built</li> <li>Robot size restrictions exist</li> <li>Robot and code can be modified by team at any time.</li> </ul>		<ul style="list-style-type: none"> <li>Robot is a single drivable unit usually with motorized mechanisms to complete missions</li> <li>Robot is pre-designed, but must be built in a 150 min period during the contest.</li> <li>Robot size restrictions exist</li> <li>Modifications to code &amp; robot are permitted only at specific times</li> </ul>	
<b>Mission Objects</b>	<ul style="list-style-type: none"> <li>15-20 diverse missions requiring a variety of robot actions ranging in difficulty</li> <li>Missions change each year</li> <li>All mission models and objects are usually fixed position and orientation (there have been some randomized missions)</li> <li>In some years, there is a joint collaborate or competitive mission that spans two robot game tables</li> </ul>		<ul style="list-style-type: none"> <li>Missions are different for each age group</li> <li>Missions generally revolve around recognition and movement of multiple similarly-sized cube-like objects</li> <li>The direction/configuration/orientation/combination of mission models changes in every round.</li> </ul>	



Photo credits: Droids Robotics and [www.wroboto.org](http://www.wroboto.org)





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## Robot Game



## Regular Category

### Sensor Usage

- Any LEGO-brand sensor listed in the rules
- Easier missions can be solved without sensors. However, use of sensors enhances the robot's performance and team's success.

- Any LEGO-brand sensor listed in the rules and the HiTechnic Color Sensor
- Sensors play a critical role in the robot game at all levels

### Programming

- Pre-programmed. Modifications allowed.
- Beginners can still participate and accomplish tasks with basic programming skills. However, advanced programming skills can be beneficial to a team's success.

- Pre-programmed, but will have to be modified for the "surprise element"
- Complex programs may be needed for successful completion of tasks

### Robot Run

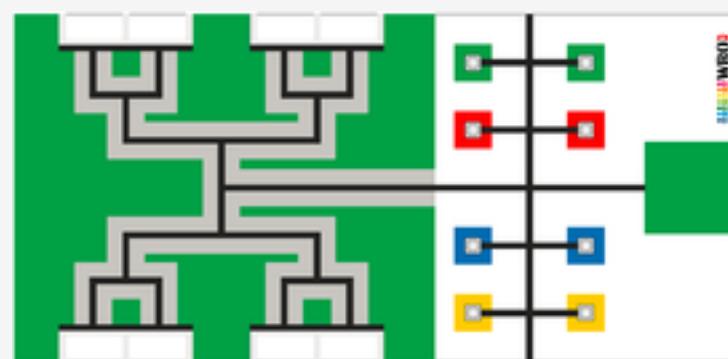
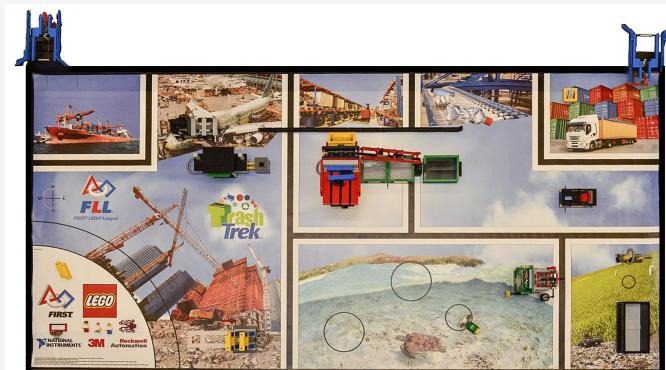
- Autonomous 2.5 min run.
- Teams may grab and rerun missions (with penalty)
- In the base area, teams can touch their robot and change attachments without penalty.

- Autonomous 2 min run.
- The robot run stops as soon as a team member touches the robot

### Element of Surprise

- No surprise rules
- Changes may not be required in the pre-constructed and pre-programmed robots

- Surprise rule is announced on the day of the challenge.
- This may call for a change in construction and/or programming



	 Project	 Open Category
<b>Overview</b>	<ul style="list-style-type: none"> <li>Project is a required component of the Challenge</li> <li>Project topic is theme-based</li> </ul>	<ul style="list-style-type: none"> <li>Open category is optional and teams elect to participate in the program</li> <li>Project topic is theme-based</li> </ul>
<b>Judging Criteria</b>	<ul style="list-style-type: none"> <li>Emphasis on real-world problem, innovative solution, and sharing solution</li> </ul>	<ul style="list-style-type: none"> <li>The project includes a booth, a presentation, a video and a prototype</li> <li>Emphasis on the innovative prototype</li> </ul>
<b>Robotics Prototype</b>	<ul style="list-style-type: none"> <li>Technical solutions are not required</li> <li>Solutions vary from educational campaigns to mock-ups</li> <li>Prototypes of any type are not required</li> </ul>	<ul style="list-style-type: none"> <li>Pre-assembled and pre-programmed prototype made with LEGO MINDSTORMS is required</li> <li>May be mixed with non-LEGO elements</li> <li>Sensors can be incorporated</li> </ul>
<b>Presentation</b>	<ul style="list-style-type: none"> <li>Creativity of presentation is integral (often includes props and costumes)</li> </ul>	<ul style="list-style-type: none"> <li>Presentations are more technical (sometimes in national costumes)</li> </ul>



Photo Credit: Razorback Open and [www.wroboto.org](http://www.wroboto.org)



# Football

2017 rules:  
<http://wro2017.org>

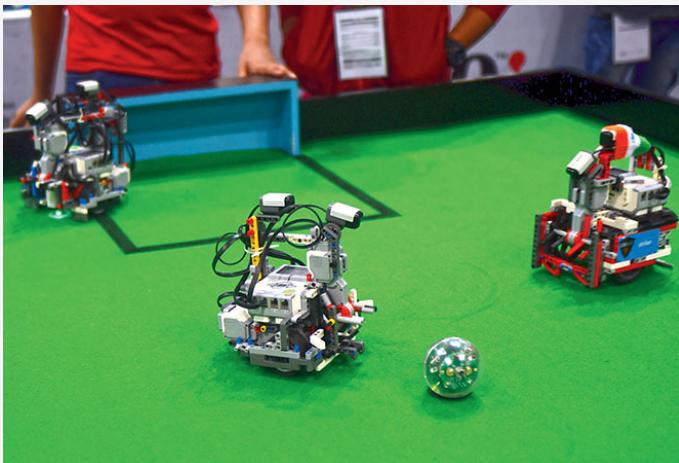


Photo Credit: [www.highlandmirror.com](http://www.highlandmirror.com)

- Autonomous LEGO MINDSTORMS robot
- All components must be LEGO-branded except for one HiTechnic IRSeeker V2 sensor, one HiTechnic Color Sensor and one HiTechnic Compass sensor per robot. Only one ultrasonic sensor is permitted.
- Ties and tape are permitted to secure wires. Non-LEGO elements can be used to construct a handle for the robot
- Pre-designed robots must be assembled from scratch at the competition
- WRO football involves 2v2 robots playing soccer with an IR ball
- Games are two 5 min halves with 5 mins between halves for repairs and reprogramming
- There are size (22cm height, 22 cm diameter circle) and weight restrictions (1kg) for your robot
- Outside specified assembly, programming, maintenance and testing times it is not allowed to modify or exchange the robot.