make it
ASSOCIATION SANS BUT LUCRATIF

LUXEMBOURG YOUTH ROBOTICS CHALLENGE

FIRST GLOBAL

2022 Competition Ruleset

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Introduction

The LYRC is Luxembourg's only youth robotics tournament as of 2021. As such, make it wants to create a unique event giving the young population an overview of STEAM and its applications in practice.

This guide will explain each competition and introduce the environment as well as the rules by which this competition will be established. As there will be some international guests, this guide will be held in English. However, "Make it" a.s.b.l. proposes for certain competitions, Luxembourgish versions on their website https://lyrc.lu.

"Make it" a.s.b.l.

"Make it" a.s.b.l. (non profit) was created in April 2018 to support the maker movement with focus on Luxembourg and its surrounding areas. The main goal of this association is to help prepare young talents to be ready for the upcoming challenges by bringing them a safe environment where they can learn new skills, share their ideas and engage in social responsible ways with our world.

"Make it" a.s.b.l. organizes a yearly national robotics challenge to ignite a passion for Science, Technology, Engineering, Arts and Mathematics (STEAM) among the many youths across Luxembourg. By bringing these future STEAM leaders together in an engaging and collaborative competition that drives home the importance, excitement, and applicability of STEAM education, "Make it" a.s.b.l. inspires students to learn the skills they will need to make the discoveries their parents and grandparents would consider miracles, impossibilities, or just plain science fiction.
With the support of the national ministry of education's innovative cell, SCRIPT, "Make it" a.s.b.l. plans these robot challenges to find a team capable of representing the Grand Duchy of Luxembourg during the FIRST Global robotic challenge competition.

As such, "Make it" a.s.b.l. thrives to foster understanding and cooperation among the youth as they use their abilities to solve the world's problems. Participation in this challenge is about so much more than just robots. As participants learn to find solutions to the world's grand challenges – water, energy, security, medicine, food, and education – they learn how to work with each other, trust each other, and become part of a truly global community.

This Document and Its Conventions

These rules are explicit. All teams are expected to abide by the LYRC competition rules as they are written and must follow the intent of the rule.
This rules manual is originally written in English but may be translated into other languages to improve the ease of access and understanding for teams. In the case of apparent conflicting meanings between a translated version and the English language version, the English version published on the "Make it" a.s.b.l. website will be considered the correct version.

Participation rules

Registration

When you have your team ready, please fill in the registration on the lyrc.lu website and send it back to "Make it" a.s.b.l. before the given deadline (see lyrc.lu website). You will receive a confirmation of your registration and a specific identity of your team.

As soon as the registration is completed, you will be contacted within a few days to discuss the hardware needed to complete the challenge. Please note that the hardware section will detail all the information necessary concerning the material chosen.

General ruleset

For all the competition, please follow the general ruleset available online through our website www.lyrc.lu. Please download the current year edition and follow the indicated rules as presented. When there are differences in the ruleset (general versus this paper), the specific ruleset per competition overrules.

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Teams

The LYRC challenge brings together young talents from the country in order to find the most talented ones to bring together a team representing Luxembourg on the upcoming challenges. As such, the competition is looking for

- young girls and/or boys,
- aged between 13 and 18 years (inclusive) for FIRST Global,
- with no skills or prerequisites required to participate.

We are looking for teams between 2 and 5 members (youngsters) plus one mentor (preferably with an experience in a science/technological domain). The team should be able to work together, meet in regular moments and provide feedback of their progress.

A team can be composed of people from all regions with the requirement to be able to work as a team and have a positive attitude towards the competition.

Competition rules – FIRST Global qualification

The competition

In today's world, resources become more and more rare and in need of protection. As such, we hear on a daily basis, that our water reserves are getting polluted by industrial waste, mismanagement or other influences.

The 2022 challenge of the FIRST Global team will be to build a robot which can help reduce waste by collecting particles on a field, and separate them according to the category they belong in. As such, your team should be able to build a robot which can differentiate between yellow and blue color, collecting and dropping the particles (in this case balls) to their respective collection points. For each correctly sorted and collected particle, there will be points scored for your team.

To enhance the collaborative aspect of the competition, teams have the possibility to build a dam on the field, so that the middle space, symbolizing a river, can be crossed.

Blue and yellow balls

To make the competition similar to the FIRST Global principles, "Make it" a.s.b.l. will distribute each team a robotic kit out of which they need to create their robot. No external parts are allowed next to the ones you will receive from "Make it" a.s.b.l.! Before the robot can compete, a jury will inspect the robot and the software it's using to make sure everything is according to this ruleset.

In the following sections, you will find information about the construction and programming of the robot as well as details about the competition in general. For all further questions, please send an email to robots@makeit.lu to inquire.

Hardware (in general)

In order to be able to participate in the LYRC competition, the competitors have to use a specific set of hardware which will be distributed by "Make it" a.s.b.l. to the mentor after the team registration has been confirmed. The hardware distributed is the sole hardware used in the competition. It is not allowed to modify the parts or temper in any other way with the distributed hardware.

The set of hardware is and will remain the property of "Make it" a.s.b.l., and the association retains itself the right to ask for compensation when parts are missing or have been destroyed during the competition process. The mentor will be asked to return the kit in its original state within one week after the competition took place. The return will be protocoled by a "Make it" a.s.b.l. member, and the mentor will receive a confirmation paper that the transaction was successfully performed or, if necessary, parts must be replaced in the kit.

Hardware (add-ons)

Based on the distributed hardware kit, teams will have the opportunity to add extra parts to their robot, following the rules indicated in this section. The extensions need to be presented separately to the jury for the team to achieve the compliance sticker for the competition. The requirements for the add-on hardware are the following :

- only passive parts are allowed (motors, sensors, etc are forbidden)
- the total weigh of the extensions cannot surpass 150 grams
- any material can be used, but preferred are PLA plastic, wood or cardboard (not extensive)

Weighing session

To prove their compliance with the previous section, teams are required to present their add-on(s) to the jury at inspection (see below). The parts will be weighed by a jury member and protocoled according to the rules. The team members presenting the robot will have to sign this protocol and, if necessary, make changes to their robot to achieve compliance. Only compliant robots will get the “check” sticker from the inspection team and, as such, will be allowed to present themselves to the competition matches.

The robot [hardware]

To make the competition fair, the robot has to follow certain restrictions when it comes to software and hardware. This will allow the competition to be more balanced.

Hardware rules

Dimensions	The final robot cannot exceed the dimensions of 30cm x 30cm x 45cm [length x width x height] at the start of the competition. During the competition, it is possible that the robot extend itself in any way to any dimension.
Aggressive behavior	Robots must not be built to harm or interfere with competitors' robots. It is strictly forbidden to make the robot engage in aggressive behavior like rampage, shooting or hindering other competitors. Teams with such a behavior will be disqualified immediately and cannot continue the competition.
Spare parts	During the competition event, there will be no spare parts available other than the ones the teams have in their kit. Whenever a motor dies or pieces are broken, teams must find an innovative solution to be able to continue the competition.
Checkup	Every robot must be inspected by the LYRC jury (see inspection booth) prior to engaging in the competition. Refer to the upcoming Inspection section for more details.

The robot [software]

The competition will require some programming. This can be done with several tools and the team can choose the one they prefer. Some recommended examples are the makeblock app, Arduino coding app, Scratch or Google Blockly. The task(s) the robot must fulfill has (have) to be achieved partly manually (executed by a human team member) and/or automatically. Here is a list of tasks to be done for either category. Software must be shown at registration booth before the event. It is not allowed to drastically change the software during the competition. Only minor changes are allowed. When both manual and automatic are allowed, the team can decide which implementation they want.

Task	Manual	Automatic
Movement on field (forward, backward, left and right)	X	X
Movement of the arm (up, down)	X	X
Detection of color		X
Clamp activation (open, close) [if used]	X	X
Detection of home/base field		X

Inspection

Each robot (hardware and software) has to be inspected by a member of the jury of LYRC before the robot and its team can present themselves to the competition. Each team must present their robot at the inspection desk at least one hour before the competition starts. Each robot, which has been cleared for the competition, will receive a sticker that has to be worn at all times on the robot. If your sticker is lost or gets destroyed, you must get a new one as teams without stickers will be disqualified.

Rules of behavior on the field

Follow the “General rules” (see above).

Competition & game

General rules & scoring

There will be as many games as required to determine a winner of the competition. Each game will last three (3) minutes and oppose two (2) teams.

Scoring for the competition will be split into several categories and the game is based on a knockout principle.

Points for matches (attributed per match)

Match points	Description	Points
Competition	Each round will have a counting of the items collected. Scoring will be added depending on the items in your home base.	
Particles	Bring back colored balls to their respective zone.	2 pts / blue ball
		5 pts/yellow ball
Dam	Build the dam (coop) to join other shore.	20 points
Come home	Bring your robot to its home zone before the clock runs out.	10 points
Park it	Park your robot on the main bridge (not touching the ground).	5 points

Points and awards (attributed once)

Award	Description	Points
Public Relations	Each team can decorate their booth with the story of their robot. The use of posters, videos, flyers, etc is encouraged. However, the cost of these items remain within the team.	20 points
Ingenious	Build your robot in an ingenious way. "Make it" a.s.b.l. smart by adding cool and interesting features that will help its performance.	20 points
Coop	Talking to other team members and sharing information to help each other is a strong skill we're looking for. The fact of not communicating with others won't benefit you!	10 points
Positive Energy	Team members should all be positive no matter where they rank or how they evaluate their chances of succeeding in the challenge. It's not about winning it's about fun with STEAM.	10 points

The competition

The competition field is a flat surface of size 2m x 3m with several zones for different purposes. Each team has a colored “home base” zone (red and blue), where the robot will start and end its course. There is a “pit” zone where your team members can freely move around. You can touch the robot only when it's in this team pit (about 1,2m x 1,2m space, where the pit overlaps the home base (60cm x 60cm)). At all the other times, touching the robot is forbidden.

The purpose of the game is to make your robot collect balls for your team while collecting them in different areas. Each ball has a specific color : yellow (heavy waste) and blue (recyclable waste). Once your robot has detected a ball’s color, it must bring it to its respective collecting station. At the end of the game, the more balls your robot has brought into the stations, the more points your team gets.

In the middle of the playfield, there is a river (symbolized by a blue colored zone), which cannot be crossed by robots. Any attempt to cross this zone results in the loss of the robot and, as such, a disqualification for the team for that match.

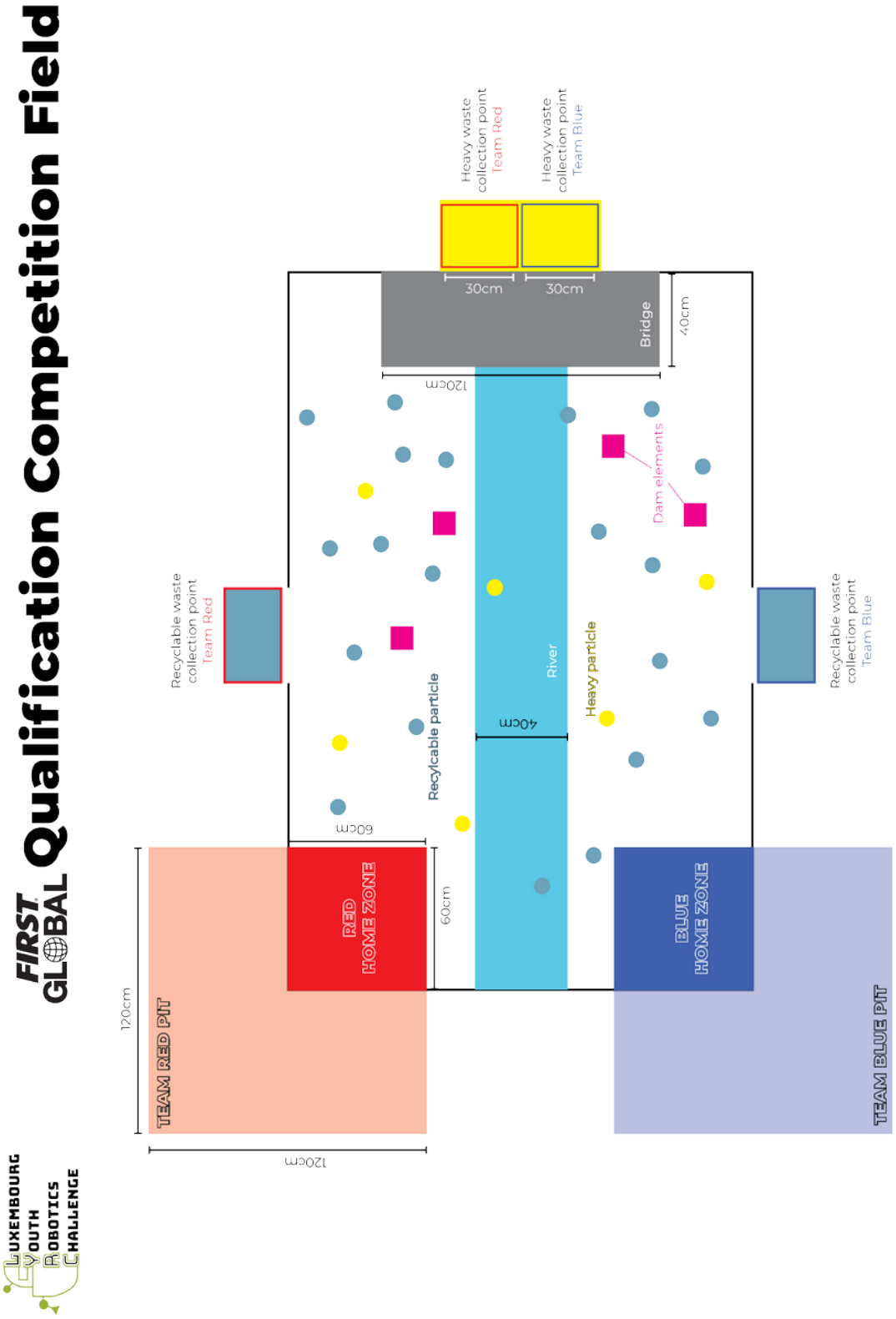
In order to cross the river, teams can build a dam using the dam pieces (2 per side) to form a line with no holes. As soon as the dam is constructed, a jury member will flip the color of the river from blue to transparent. This means that the river can be safely crossed by robots.

As long as there is no dam installed, the river can only be crossed at the bridge (end of playfield).

There's a bonus score on the robot being parked inside your team zone or onto the bridge when the game has ended. Robots need to stay at least for 10 seconds in their parked position (without manual control) in order to earn the bonus points.

To start the game, a jury member will pour the balls from the team zones (middle of the competition field) onto the game zone. Balls will be distributed randomly, with the possibility that some will be placed into the river zone. Those balls can only be retrieved when the river is dry (by building the dam).

Example of field :



Game rules

1. During the competition, there can only be a maximum of two (2) team members in the pit area. The mentor is not allowed in the pit area. Team members can move freely in the designated pit area but cannot leave this area. Calls from the judges/referees must be observed.
2. The teams must be on the field **at least** 5 minutes prior to competition time, ready to perform. As soon as the competition is over, teams are required to leave the pit cleaned up for the next team to arrive. Not showing up in time will result in a loss by forfeit for the team not attending.
3. Robots must stay on the competition field. If a robot goes completely out of bounds or appears to have a high likelihood of interfering with the game, it will be disabled by the Head Referee for the rest of the match. The robot can be attended after the match has finished and can be re-enrolled in the next match.
4. Robots must not be dangerous or damaging to the field, or humans around the field. Robot or team actions should not damage the field or field elements or pose a safety risk to other team members or volunteers. If the Head Referee determines the team to be in violation of this rule, or that the team has a high likelihood of violating this rule, the robot may be disabled for the match and must be re-inspected before taking the field again.
5. Once a robot leaves the field of competition (for example by falling off the field), it will be disabled to rejoin the current game. There is no possibility to get the robot back on the field.
6. Play the game as written. These rules are written as simply as possible to make them as accessible as possible, regardless of a team's native language. Attempts to gain competitive advantage by employing an unintended method of play violates the rules and does not meet the spirit of the competition.
7. Robots must start the match within a 30cm x 30cm x 45cm volume (length x width x height). Before a match can start, all robots on the playing field must meet this requirement and carry the "checkup" sticker obtained from the Jury's inspection desk.

8. Each drive team may consist of minimum 1, maximum to 2 members. These are the only team members allowed at the field/pit zone and to set up the robot. Team members must remain in the pit during a match and cannot be replaced by another team member as long as the match lasts.
9. Robots cannot pass the “river” zone when it’s still “running water”. Only when the dam is built, and the river changes color to match the field, passing is allowed.
10. No communication is allowed with persons outside the team during a match.
11. Team members should not touch anything inside of the playing field until a referee indicates that it is safe to do so. Team members should not reach into the playing field and contact the field surface, field structures, any game elements, or robots, either directly or transitively through an object, unless the flags on the field are green to indicate that the playing field is safe to enter. This rule applies both before and after the match, and in all situations.
12. Robots should stay in one piece on the field and may not intentionally detach and/or shoot parts on the field during a match. If a piece falls of the robot, the head referee will decide upon the action to be taken.
13. Don’t intentionally damage, tip over, or disable other robots. Strategies which are aimed at damaging, tipping or disabling other robots are not allowed. Teams are responsible for the actions of their robots at all times. Driving recklessly is not an excuse for tipping or damaging another robot. Teams are also responsible for building a robust robot which will not easily tip or become entangled due to minor contact.
14. Scores will be calculated when everything comes to rest at the end of the match.
15. Robots must function in imperfect situations. The field and placement of items within the playing field may vary by up to ± 50mm except if specifically noted in the field build guide. Robot designs should be robust enough to work effectively even if the field or game elements are not perfectly sized or have a slightly different texture or color.
16. After the match has started, a team’s robot can only be interacted with in the team “home base” zone. Outside this area, no touching is allowed.

17. Communication with spotters in the stands or via any wireless communication means is not allowed. This rule is not intended to apply to general cheering and support.
18. Accidental tipping and entanglement may occur and is part of normal game play, however intentional or egregious violations as determined by the Head Referee may result in disqualification. Repeat offenses may result in a team being disqualified from the rest of the event.
19. Once the robot has moved under its own power, the robot may not be touched (outside the team's home zone) by any humans until the match has ended. Teams can only repair their own robot in their home zone, where robot contact is explicitly allowed.
20. Strategies aimed at causing an opponent to violate a rule are not allowed. If a team forces an opponent to violate a rule, the penalty that would typically be assigned to the opponent will instead be assigned to the alliance that forced the violation.
21. Robots may not grab, grapple, or grasp field elements unless otherwise explicitly permitted. Robot mechanisms should not be designed to react against multiple sides of a field element. This rule excludes game objects.
22. Scores are final and there are no replays, all Head Referee decisions are final and not up for discussion. All of the volunteers at LYRC work hard to provide fair and consistent game experience for all teams, but they are human and may make mistakes. How teams deal with adversity will say as much about their character as how they deal with success. Teams should avoid situations which could be rules violations and make their scoring actions very clear to avoid misunderstandings.
23. All teams are expected to behave in a respectful and professional manner when interacting with other teams and staff during the LYRC event. Students and adults are held to the same standard, and teams may be disqualified from the LYRC competition for uncivil or egregious behavior from any party affiliated with the team. This rule is intended to prevent teams from damaging the field, either intentionally or unintentionally.
24. If teams have questions about rules or rulings, there will be a designated area near the field where the team can wait for the Head Referee or Technical Advisor and discuss the concern.

25. Robots must start each match inside the “launch” area located on the home base zone (colored in the respective team's color).
26. As soon as the match timer runs off, teams are required to drop their remote(s) and lift their hands up over their head, so that referees can confirm the match was ended correctly. Referees will signal when team members can lower their hands again.
27. Rules can be enhanced/extended for an increase in difficulty at higher competition levels. Teams will be informed via paper release of the additional rule set(s).

The team booth

At the LYRC, each competing team will have a booth space of approx. 3m x 2m. The space provided should be divided in different areas, for example a repair area, where they can attend to their robot, but most importantly, also a public relations area, where the team should present their robot and its history. The space should be used to present how their robot was built by showing some initial ideas, drafts, sketches up to the final result. Visitors should get a good idea of the effort the team made to build their robot. Exhibitors should also present the code used to program the robot.

The teams can use any method to present their work (slideshows, posters, pictures, printouts,...). The only limit teams have is the space they occupy. It cannot at any time, exceed the initial measures of 3m x 2m. Any excess will result in not scoring the PR points.

The jury will look at the booth and interview your team in order to distribute the points awarded to the PR section of the competition.