GENERAL RULES

VERSION: JANUARY 15TH 2022

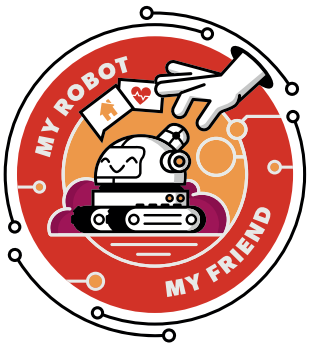
WRO®
WORLD ROBOT OLYMPIAD ™

ROBO
MISSION

BUILD AND PROGRAM
A ROBOT THAT SOLVES
TASKS ON A FIELD

AGE GROUPS:
8-12 / 11-15 / 14-19

WRO® 2022
MY ROBOT MY FRIEND



WRO INTERNATIONAL PREMIUM PARTNER

LEGO education

WRO RoboMission Category – General Rules

Table of Content

General information

Introduction

In the WRO RoboMission category teams design robots that solve challenges on a competition Field. The robots are fully autonomous. For each age group a new field and mission are developed each year. On the day of the competition a surprise rule adds a new element to the mission. An extra challenge will test the creativity and quick-thinking skills of the teams at national and international events. For more Information for General information please refer WRO India (city) General Information rule book.

Focus Areas

Every WRO category and game has a special focus on learning with robots. In the WRO RoboMission category, students will focus on developing in the following areas:

- General coding skills & basic robotics concepts (perception of environment, control,
- navigation).
- General engineering skills (building a robot that can push/lift objects of certain sizes).
- Developing optimal strategies to solve concrete missions.
- Computational Thinking (e.g., tinkering, debugging, collaboration etc.).
- Teamwork, communication, problem solving, creativity.

Age appropriate missions: The fields and missions are designed with a growing difficulty and complexity from Elementary to Senior age group. The rising complexity is seen in the:

- Route on the field (e.g., line following or only markers).
- Technical complexity of the missions (e.g., pushing, lifting, grabbing game objects).
- Randomness of the game elements (e.g., one or multiple random situations).
- Variety of game elements (e.g., number of different colored and/or shaped objects).
- Required accuracy of the solutions to the missions (e.g., a big target area or a small spot).
- Overall complexity in the combination of the elements mentioned before.

All these aspects lead to different requirements for the mechanical design of the robot and the complexity of the code. When participating in WRO for multiple seasons, the teams can grow and develop with the program, solving increasingly complex missions as they get older.

1. Robot material & regulations:

1.1. Every team builds one robot to solve the challenges on the field. The maximum robot dimensions before the robots starts a run are 250 mm x 250 mm x 250 mm. Cables must be included in these dimensions. After the robot has started, the dimensions of the robot are not restricted.

1.2. Teams are allowed to use only the following materials to build the robot:

Controller	LEGO® Education MINDSTORMS® NXT or EV3; LEGO® Education SPIKE™ PRIME; LEGO® MINDSTORMS® NXT, EV3 or Robot Inventor.
Motors	Only motors from the platforms/sets mentioned at “Controller”.
Sensors	From the platforms/sets mentioned at “Controller”. In addition, it is allowed to use the following materials: • HiTechnic Color Sensor
Batteries	Only official LEGO rechargeable batteries (no. 9798 or 9693 for NXT, no. 45501 for EV3, no. 45610 or no. 6299315 for SPIKE/Robot Inventor).

Building Materials	For the construction of the robot only LEGO® branded elements are allowed.

1.3. It is allowed to cut the size of original LEGO® ropes or tubes. Any other modification on any other original LEGO® or electronical part is not allowed, and it is not allowed to use screws, glues or tape or any other Non-LEGO® material to fasten any components on robots.

1.4. The number of motors and sensors to be used is not restricted. However, it is only allowed to use official LEGO® materials to connect motors and sensors to the controller.

1.5. If a team wants to use any equipment to align in the start area, this equipment must be built out of LEGO® materials, it must fit into maximum robot dimensions.

1.6. A team is allowed to bring and use only one controller during practice time or robot runs. The team can bring spare controllers but the team should leave it with the coach. If the team needs a spare controller, the team should contact the judge before getting the spare part.

1.7. A team should place the controller in the robot in a way that makes it easy to check the program and stop the robot by a judge.

1.8. A robot must be autonomous and finish the missions by itself. Any radio communication, remote control and wired control systems are not allowed while the robot is running.

1.9. A team is not allowed to perform any actions or movements to interfere or assist the

1.10. Robot after the robot started with the run. A team is not allowed to perform any actions or movements to interfere or assist the robot after the robot started with the run.

1.11. Any software to code the robot is allowed and teams can prepare the code before the competition day. If a team uses a software that requires an online connection (e.g. a browser-based tool), the team should check if there is an offline version for the competition day. The competition organizer is not responsible to provide an online infrastructure (e.g. WiFi for everyone).

1.12. Bluetooth, Wi-Fi or any remote connection must be switched off during check time and robot runs. Only teams can use remote connections if there is no other way to transfer the code from a device (e.g. a tablet) to the controller. However, it is strongly recommended to transfer code via cable to avoid problems (e.g. multiple devices with the same name) at the competition day. Of course, it is not allowed to interfere or obstruct any other team or robot with the remote connections a team uses.

1.13. Use of SD cards to store programs is allowed. SD cards must be inserted before check time and may not be removed until the next practice time starts.

1.14. A team should prepare and bring all the equipment, enough spare parts, software and portable computers it needs during the tournament. Teams are not allowed to share a laptop and / or the program for a robot on the competition day. The competition organizer is not responsible for the maintenance or replacement of any material, not even in case of any accidents or malfunctions.

1.15. The robot can be marked (label, ribbons, etc.) to prevent participants from losing it or confusing it with the robots of the other teams, as long as this does not change its performance or give clues about the assembly process.

2. Game table and equipment

2.1. In this category, the robot solves missions on a field. Every field consists of a game table (an even ground with boarders) and a printed mat that is put into the game table. Every age group has its own mat because in every age group there are different missions to solve.
2.2. The dimensions of a WRO mat in an age group are 2362 mm x 1143 mm. Game Tables have the same size or max. +/- 5mm in each dimension. The official height of the boarders of a game table is 50mm, higher boarders can be used as well.
2.3. The game mat must be printed with a matt finish/overlay (without reflecting colors!). The preferred printing material is a PVC tarp with around 510 g/m² (Frontlit). The material of the game mat should not be too soft (e.g. no mesh banner material).

2.4. All black lines that a robot could follow have at least a width of 20mm. Other colors that should be identified by the robot will follow the limitations of the allowed sensors.
2.5. The game elements are built from the WRO Brick Set (no. 45811). Other materials, e.g. bricks from an EV3/SPIKE Core Set or wood, paper or plastic, may be used to a limited extent to make the games even more interesting.
2.6. If the position of game objects on the field is not clearly defined and the specified area for the game object is larger than the object itself, the object should be place centered in an area.

3. Tournament Format and Procedure.

3.1. The Competition shall be for one day.
3.2. Teams are allowed to bring pre-build robots.
3.3. There will be a practice time of 120 mins before 1st rounds starts.
3.4. There will be total 3 rounds.
3.5. The average of all 3 rounds' score and time will be considered for ranking the teams.
3.6. Coaches are not allowed to enter team areas to provide any instructions and guidance during the competition. Specified coaching times, where teams and coaches meet, can be defined
3.7. Before practice time is over, the teams must place their robots on the robot parking area.
3.8. A robot that is not handed in, on time, cannot participate in the respective round.
3.9. Before the robot is placed on the robot parking, the robot is only allowed to have one executable program (sub-programs that belong to one core program are OK). Judges must have the opportunity to clearly identify one program on the robot, ideally (and if possible) name the one executable program "runWRO" (NXT/EV3) or use one program on slot one (SPIKE) on the robot. If a naming is not possible in your programming environment, please inform the judges about the program name beforehand (e.g. by writing the program name on the sheet in quarantine area next to your team name). If there is no program on the robot, the team cannot join this round and is disqualified for this attempt
3.10. During check-time, the judges will inspect the robot and check all regulations. If a violation is found at the inspection, the judge will give the team three minutes to convert the violation. It is not allowed to transfer new programs during these three minutes. If the violation cannot be solved during the time, the team is disqualified for that round.

4. Robot attempt

4.1. Each robot attempt is 2 minutes. Time begins when the judge gives the signal to start.

4.2. The robot must be placed in the starting area so the projection of the robot on the game mat is completely within the start area. The participants are allowed to make physical adjustments to the robot in the starting area. However, it is not allowed to enter data to a program by changing positions or orientation of the robot parts or to make any sensor calibrations of the robot.

4.3. In the event that starting a program directly sets the robot in motion, the team needs to wait for the start signal of the judge before starting the program.

4.4. In the event that starting a program does not directly set the robot in motion, participants are allowed to start the program before the start signal. After that, it is allowed to set the robot in motion by pressing the central button on the controller, no other buttons or sensors are allowed to start the robot. If a SPIKE PRIME/Robot Inventor controller is used, it is allowed to use the left button on the controller to set the robot in motion.

4.5. If there is any uncertainty during the robot attempt, the judge makes the final decision. The judge should decide in favor of the team if no clear decision is possible.

4.6. A robot attempt will end if

- 4.6.1. The robot attempt time (2 minutes) has ended.
- 4.6.2. Any team member touches the robot. or any mission objects on the table during the run.
- 4.6.3. the robot has completely left the game table
- 4.6.4. the robot or the team violated rules or regulations
- 4.6.5. A team member shouts “STOP” and robot does not move anymore. If the robot is still moving, the robot attempt will only end once the robot stops by itself or is stopped by the team or judge.

4.7. Once the robot attempt has ended, time is stopped and the judge scores the attempt.

4.8. The scores are noted on a scoring sheet (on paper or digital), the team need to sign off the scores (on paper or digital signature/checkbox). Once the score is signed off no further complaint is possible

4.9. If a team does not want to sign off after a certain period of time, the judge can decide to disqualify the team for this round. It is not allowed that a team coach joins the discussion with judges on the scoring of the run. Video or photo proofs will not be accepted. If a team touches or changes the task objects on the playing field during the attempt, the team will be disqualified for this round.

4.10. A disqualification of a team in a round will result into a robot attempt with maximum negative score and maximum time (120 seconds.

4.11. If a team finishes an attempt without having solved a (partial) task that yields positive points, the time of that run will be set at 120 seconds.

4.12. If the two team have same score then Ranking will be decided by record of time

5. Game documents and rule hierarchy
   Please refer the rule 8 of WRO India city 2022 General Rule Information for Hierarchy
6. Awards
   Please refer the rule 9 of WRO India city 2022 General Rule Information for Awards