General Rules – 2016 Season

Content

A. Competition Categories

The World Robot Olympiad has four competition categories:

1. Regular Category
2. Open Category
3. WRO Football
4. Advanced Robotics Challenge

A team may only participate in one category.

B. Age Group Definition

1. Elementary (Primary) School Age: Participants up to 12 years old in the year of competition.
2. Junior High (Middle) School Age: Participants 13 - 15 years old in the year of competition
3. High (Secondary) School Age: Participants 16 – 19 years old in the year of competition
4. WRO Football: Participants 10 – 19 years old in the year of competition
5. Advanced Robotics Challenge: Participants 17 – 25 years old in the year of the competition

NOTE:

- It is strictly enforced that students cannot be older than specified in the Age Group Definition and will not be allowed to participate in the International Final.
- Students younger than the age group definition have to obtain permission from the Host Country for participation in the international final and may only be approved if at least one other team member has the correct age
- If all members of a team are younger than required, then the team must participate in the corresponding competition
- Participants are not confined to school-going students. Anyone can participate in the corresponding age groups except for participants in the Advanced Robotics Challenge who MUST be either High School or undergraduate students

  College and university students may participate Open and Regular High School and WRO Football if the individual students fit into the HS age group bracket!

C. Team Definition

The WRO is a team-based challenge. To participate in each category of competition, students must work in teams.

A team consists of one (1) coach and two (2) or three (3) team members.

One (1) coach and one (1) team member is not considered to be a team and cannot participate.

D. Coaches

The minimum age of a coach in an international WRO tournament (and assistant coaches) is age 20 at the time of registration for the WRO final.

Coaches may work with more than one team; however each team needs to be assisted by a responsible adult. This person may be an assistant coach.

Coaches may offer students advice and guidance prior to the competition, however during the actual Olympiad competition, **all work and preparation** must be performed by the student members of the team.

E. General Rules – Regular Category

1. The rules of competition at WORLD ROBOT OLYMPIAD are constituted by the WORLD ROBOT OLYMPIAD Advisory Council ("the council" in the following paragraphs).

1.1. A surprise additional rule will be announced on the morning of the competition.
1.2. The announcement of this additional "surprise" must be handed over to each team in writing.

2. Qualification for participation and team composition

2.1. Age of participants – Please refer to **Section B** - "Age Group Definition"
2.2. Team composition – Please refer to **Section C** – "Team Definition"
2.3. Team coach – Please refer to **Section D** – "Coaches"
2.4. Participating teams cannot compete in any other WRO competition category.

3. Material

3.1. The controller, motors and sensors used to assemble robots must be from LEGO® MINDSTORMS ™ sets (NXT or EV3) and the HiTechnic Color Sensor. Other LEGO branded elements may be used to construct the remaining parts of the robot. WRO recommends use of Education versions of LEGO MINDSTORMS
3.2. Teams should prepare and bring all the equipment, software and portable computers they need during the tournament.
3.3. Teams should bring enough spare parts. Even in the case of any accidents or equipment malfunction, the council (and/or organizing committee) is not responsible for their maintenance or replacement.
3.4. Coaches are not allowed to enter the court to provide any instructions and guidance during the competition.
3.5. All the parts for the robot should be disassembled and in their initial state (**not pre-built**) when the "assemble" time starts. For example, a tire cannot be put on a wheel until assembly time begins.
3.6. Competitors may not use any instruction sheets/guides whether written, illustrated or pictorial no matter what format they are in (including paper-based and digital).
3.7. Contestants may make the program beforehand.
3.8. Robots are not allowed to use screws, glues or tape to fasten any components. Non-compliance with these rules will result in disqualification.
3.9. Control software must be either ROBOLAB® NXT®, EV3 software or LabView. See details on eligible controller/software combinations for WRO Regular Category in this chart:

	Robolab	NXT Software	EV3 Software	Labview*
NXT	☑	☑	☑	☑
EV3	÷	÷	☑	☑

**LabView is ONLY permitted in the High School age group*

3.10. The motors and the sensors for the robot are supplied by LEGO® and HiTechnic. Any other products are not allowed. Teams are not allowed to modify any original parts (for example: EV3, NXT, motors and sensors, etc). A robot made with modified parts will be disqualified at that match. Allowed sensors and motors:

	9842 - NXT Motor with Tacho
	9843 - NXT Touch Sensor
	9844 - NXT Light Sensor
	9845 - NXT Sound sensor
	9846 - NXT UltraSonic sensor
	9694 - NXT Colour sensor
	45502 – Large Motor
	45503 – Medium Motor
	44504 – Ultrasonic Sensor
	44506 – Color Sensor
	44507 – Touch Sensor
	44509 – Infrared Sensor

	45505 – Gyro Sensor
	HiTechnic NXT Color Sensor V2

4. Regulations about the robot

4.1. The maximum dimensions of the robot before it starts the "mission" must be within 250mm × 250mm ×250mm. After the robot starts, the dimensions of the robot are not restricted.
4.2. Teams are allowed to use only one controller (NXT or EV3).
4.3. The number of motors and sensors to be used is not restricted.
4.4. Any actions or movements by the participants are not allowed to interfere or assist the robot while it is running (performing the "mission"). Teams that violate this rule will be disqualified at that match.
4.5. 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. Teams in violation of this rule will be disqualified and must quit the competition immediately.
4.6. The Bluetooth and Wi-Fi function must be switched off at all times.
4.7. Use of SD cards to store programs is allowed. SD cards must be inserted before the robot is inspected and may not be removed for the duration of the competition once inspection is completed

5. Prior to competing

5.1. Each team must prepare for the match in their specified place until the "check time", when the team's robot must be placed in a designated area.
5.2. Teams cannot touch designated competition courts before the start of the "assembly time" is announced.
5.3. Judges will check the state of parts before announcing the start of the "assemble time". Teams must show that their parts are separated. Team members cannot touch any parts or computer during this "check time".
5.4. The "Assemble time" doesn't begin until officially announced at the event.

6. Competition

6.1. The competition consists of a number of rounds (as decided by the Host Country), assembly time, programming and testing time (150 minutes)
6.2. Competitors cannot assemble robot outside of specified assemble, maintenance and testing times.

6.3. Qualifying teams will be given time for assembling, programming and calibrating their robot before each round.
6.4. Competitors begin assembly once assembly time is officially announced at the event and can immediately start the programming and test runs. Teams must place robots in their designated inspection area when any Assembly or Maintenance time ends, after which the judges will assess if the robot conforms to all regulations. Upon successful inspection the robot will be allowed to compete.
6.5. After rounds end, qualifying teams will be provided with additional maintenance and testing time. Teams must place robots in their designated inspection area when any Assembly or Maintenance time ends, after which the judges will assess if the robot conforms to all regulations. Upon successful inspection the robot will be allowed to compete in the next stage of the competition.
6.6. The score calculation is done by the judges at the conclusion of each round. The team must verify and sign the score sheet after the round, if they have no fair complaints.
6.7. The ranking of a team is decided by their best score of a round. If competing teams acquire the same points, the ranking is decided by the record of time (where time has not already been taken into consideration of the scores calculation). If teams still remain tied, rankings will be determined by consistency of performance by examining which team achieved the next highest score during previous rounds.
6.8. If a violation is found at the inspection, the judge will give the team three (3) minutes to convert the violation. However, it is not possible to participate in the match if the violation is not corrected during the time given.
6.9. Outside specified assembly, programming, maintenance and testing times, it is not allowed to modify or exchange the robot. (For example, it is during inspection time teams are not permitted to download programs to robots or change batteries). However batteries are allowed to be charged during any specified "quarantine" time. Teams cannot request time out.

7. Court

7.1. Teams must assemble their robot in an area designated by tournament officials (each team has its own area). People, other than competing students are not allowed to enter the competition area, apart from authorized WRO Organizing Committee staff and special personnel.
7.2. The standard of all competition materials and courts are according to what are provided by the committee on the competition days.

8. Prohibited matters

8.1. Destruction of competition courts/tables, materials or robots of other teams.
8.2. Use of dangerous items or behaviors that may create or cause interference with the competition.
8.3. Inappropriate words and/or behavior toward other team members, other teams, audience, judges or staff.
8.4. Bringing a cellular/mobile phone or a medium of wire/wireless communication into the designated competition area.

8.5. Bringing food or drink into the designated competition area.
8.6. Competitors using any communication devices and methods while the competition is in process. Anyone outside the competition area is also banned from talking to or communicating with competing students. Teams violating this rule will be considered as disqualified and should quit the competition immediately. If communication is necessary, the committee may allow team members to communicate with others under supervision by tournament staff or by exchanging a note under permission by judges.
8.7. Any other situation which judges might consider as interference or violation of the spirit of the competition.

F. General Rules – Open Category

1. **The rules of competition at WORLD ROBOT OLYMPIAD are constituted by the WORLD ROBOT OLYMPIAD Advisory Council ("the council" in the following paragraphs).**

2. **Qualification for participation and team definition**

   2.1. Age of participants – Please refer to **Section B** – "Age Group Definition"
   2.2. Team composition – Please refer to **Section C** – "Team Definition"
   2.3. Team coach – Please refer to **Section D** – "Coaches"
   2.4. Participating teams cannot compete in any other WRO competition category.

3. **Material**

   3.1. The size of the booth provided to teams will be 2m ×2m × 2m. (Each team will be provided with three (3) vertical display surfaces within the booth, each 2m × 2m or as close as possible).
   3.2. All elements of a team's display must remain within the allotted 2m × 2m × 2m booth area. Team members may be outside this space during a presentation, however, unless requested by judges, robots and other display elements must remain within the allotted area.
   3.3. Teams will be provided with the option of using a table. The size of table will be 120cm × 60cm (or as close as possible). Table sizes will be consistent across teams. Tables must be placed within the 2m × 2m floor space allocated to the team. Teams will be allocated four (4) chairs in their booth area.

4. **Regulations about the robot**

   4.1. There is no restriction on the balance between LEGO® elements and other materials.
   4.2. All robots must be operated by NXT or EV3 controllers and any software.
   4.3. Robots may be preassembled and software programs may be pre-made!

5. **Competition**

   5.1. Open Category teams must go through this process:
   - Final assembly and testing of the robot
   - Preparation of the booth (including display of posters, etc.)
   - Pre-judging inspection to assess adherence to the rules
   - Final preparation time (ensuring that rules are adhered to)
   - Demonstration and presentation to the judges (including Q & A from judges) and demonstrations and presentations to the general public.

   5.2. At the time of registration, teams must electronically submit a written and illustrated report summarizing what the robot can do, and in which way the robot is unique and conforms to the theme.

The report must include a visual description incorporating pictures, diagrams, and/or photos from different angles and an example of the program. A copy of the report must be handed out to the judges in paper form at the time of judging.

5.3. At the time of registration, teams must submit a video (maximum of 2 minutes) demonstrating their robot.

WRO recommends that videos are done in English or subtitled in English. This is to aid judges in understanding the project better. Teams should also add keywords to their videos for library purposes.

5.4. Teams must decorate the booth with one or more posters with the minimum dimension of 120 cm × 90 cm. The poster(s) should introduce the robot project to the visitors.

6. Presentation

6.1. All team displays must be completed and teams ready to present to judges and the general public by the allotted time (Deadlines will be provided by the Organizer one month in advance of the competition).

6.2. Teams must maintain a presence within the team's booth during competition hours in order to present to members of the general public and judges at any time. Teams will receive a warning of not less than 10 minutes prior to judging taking place.

6.3. The judging will be executed in three age groups: Elementary, Junior High, and High. Please refer to **Section B** – "*Age Group Definition*"

6.4. Teams will be allocated approximately 10 minutes for judgment: 5 minutes to explain and demonstrate the robot, remaining 2-5 minutes to respond to questions from the judges.

6.5. Official language for all presentations is English. Interpreters are not allowed.

7. Judging Criteria for Open Category

Category	Criteria	Points	Score
1. Project **(Total Points: 50)**	**1. Creativity & Quality of Solution** - The project was unique and showed creative thinking. Project is well-thought out and has a realistic solution / design/ concept.	25	
	2. Research & Report - The team demonstrated that they researched their idea and was able to clearly report their findings	15	
	3. Entertainment Value - The project had a certain "WOW" factor, it made me want to see it again or learn more about it	10	
2. Programming (Total points: 45)	**1. Automation** - The project can perform on its own with little to no human intervention. The unit makes decisions based on appropriate use of sensors	15	
	2. Good Logic - The programming makes sense and flows with a good deal of logic based on input data from sensors	15	
	3. Complexity - The algorithm of the program has non trivial components of sequence, decision making, iteration, and hierarchical decomposition structures.	15	
3. Engineering Design **(Total Points: 45)**	**1. Technical Understanding** - The team explained clearly and knowledgeably how their project worked	15	
	2. Engineering Concepts - The project shows evidence that sound engineering concepts were used in the project	10	
	3. Mechanical Efficiency - The overall design of the project demonstrates a consideration for mechanical efficiency (i.e. proper use of gearing, means to reduce friction, economic and streamlined use of parts; easy to repair / modify, etc.)	10	
	4. Structural Stability - The project is sturdy and can be operated repeatedly without needing repairs	5	
	5. Aesthetics - The project is appealing to the eyes, it appears that the team went out of their way to make the project look as professional as possible	5	
4. Presentation **(Total Points: 40)**	**1. Successful Demonstration** - The project worked as expected, and could continue to do so with a certain degree of repeatability	15	
	2. Communication & Reasoning Skills - The students were able to explain what their project was about, how it works and WHY they decided to build it	10	
	3. Quick Thinking - Students are able to easily answer questions about their project	5	
	4. Posters and Decorations - The materials used to explain and teach others about their project are clear, concise and are neatly prepared	5	
	5. Project video	5	
5. Teamwork **(Total Points: 20)**	**1. Unified Learning Outcome** - The team was able to demonstrate that all members shared equally in the learning process	10	
	2. Inclusiveness - The team was able to demonstrate that all members played an important role in the construction and presentation of their project	5	
	3. Team Spirit - All team members showed enthusiasm and seemed excited to share their project with others	5	
	Maximum Points	200	

***Projects that are clearly not within the theme will receive a score of 0.**
Judges are requested to score each category from 0 to 10 with 10 being maximum. A score of 9 to a criteria worth 25 points is equivalent to 22.5 points etc.

G. Advanced Robotics Challenge

1. **The rules of competition at WORLD ROBOT OLYMPIAD are constituted by the WORLD ROBOT OLYMPIAD Advisory Council ("the council" in the following paragraphs).**

    1.1. A surprise additional rule will be announced on the morning of the competition.
    1.2. The announcement of this additional "surprise" must be handed over to each team in writing.

2. **Qualification for participation and team composition**

    2.1. Age of participants – Please refer to **Section B**- "Age Group Definition"
    2.2. Team composition–Please refer to **Section C**– "Team Definition"
    2.3. Team coach – Please refer to **Section D**–"Coaches"
    2.4. Participating teams cannot compete in any other WRO competition category.

3. **Materials**

    3.1. The controller used for the robot must be from NI (National Instruments) MyRIO or KNR (MyRIO based) or the LEGO® MINDSTORMS ™ EV3

	MyRIO
	KNR (MyRIO based)
	EV3 x 2

3.2. Building system: MATRIX or TETRIX only

	MATRIX
	TETRIX

*It is not permitted to make alterations to any materials from Matrix or TETRIX.

3.3. Control software must be LabVIEW from National Instruments or any C language (like C, C++, C#, RobotC) software.

3.4. Teams can use any sensors of their choice – no restrictions on brand, function or number of sensors used

3.5. Teams can use any electrical motors and servos of their choice – no restrictions on brand or number of motors and servos used

3.6. Teams can use any battery of their choice – no restrictions on brand, function or number of batteries used.

3.7. Teams may use only one controller if myRIO or KNR – and maximum two controllers if EV3

3.8. Teams can't use any hydraulic pressure or barometric pressure

3.9. Teams should prepare and bring all the equipment, software and portable computers, they need during the tournament.

3.10. Teams should bring enough spare parts. Even in the case of any accidents or equipment malfunction, the council (and/or organizing committee) is not responsible for their maintenance or replacement.

3.11. Coaches are not allowed to enter the court to provide any instructions and guidance during the competition.

3.12. Robots may be assembled before the tournament

3.13. Contestants may make the program beforehand.

3.14. Teams using EV3s as controllers may daisy-chain two EV3 controllers

4. Regulations about the robot

4.1. The maximum dimensions of the robot before it starts the "mission" must be within 450mm × 450mm × 450mm. After the robot starts, the dimensions of the robot are not restricted.

4.2. Robots are autonomous. Participants are not allowed to interfere or assist the robot while it is running (performing the "mission"). Teams that violate this rule will be disqualified at that match.

4.3. 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. Teams in violation of this rule will be disqualified.

4.4. Any Bluetooth or Wi-Fi function on the controller must be switched off at all times

5. Prior to competing

5.1. Each team must prepare for the match in their specified place until the "check Time", when the team's robot must be placed in a designated area.
5.2. Teams cannot touch designated competition courts before the start of the "Practice time" is announced.

6. Competition

6.1. The organizer will perform uniform timing throughout the competition, which will consist of two preliminary rounds (each round will consist of three games), and one final round (consisting of five games).
6.2. After the conclusion of the preliminary rounds, based on the score, the top 16 robots will enter the final round.
6.3. On the day of the competition, there will be 60 minutes of Practice time before the start of the first round.
6.4. The contestants may use this time to perform Practices in their places, or may queue with their robots to have one practice game, or may take measurements in the competition site in so far as this does not interfere with other teams' practice.
6.5. Teams cannot touch the designated competition lanes before the start of the "practice time" is announced
6.6. All robots must be placed on the reviewing table for preparatory review after the end of the Practice period. No mechanisms or programs may be modified after this time.
6.7. Robots may take part in the competition only after they have passed review by the judges.
6.8. If the robot does not pass the review by the judges, the robot may not be used in the competition
6.9. Preparation time before each game may not exceed 60 seconds, and, once started, individual games may not exceed 180 seconds. In a game the robot rolls two balls, and that has to be completed in 180 seconds.
6.10. After all teams have completed the first round, there will be 20 minutes of "practice time", the robots will be reviewed again, and the second round will then begin.
6.11. After the competition begins, the robots must autonomously leave their base, move to the ball rack, and pick up a ball.

7. Court

7.1. People, other than competing students are not allowed to enter the competition area, apart from authorized WRO Organizing Committee staff and special personnel.
7.2. The standard of all competition materials and courts are according to what are provided by the committee on the competition days.

8. Prohibited matters

8.1. Destruction or tampering with competition courts/tables, materials or robots of other teams.
8.2. Use of dangerous items or behaviors that may create or cause interference with the competition.
8.3. Inappropriate words and/or behavior toward other team members, other teams, audience, judges or staff.
8.4. Bringing a cellular/mobile phone or a medium of wire/wireless communication into the designated competition area.
8.5. Bringing food or drink into the designated competition area.
8.6. Competitors using any communication devices and methods while the competition is in process. Anyone outside the competition area is also banned from talking to or communicating with competing students. Teams violating this rule will be considered as disqualified and should quit the competition immediately. If communication is necessary, the committee may allow team members to communicate with others under supervision by tournament staff or by exchanging a note under permission by judges.
8.7. Any other situation which judges might consider as interference or violation of the spirit of the competition.