



## World Robot Olympiad 2020

### ADVANCED ROBOTICS CHALLENGE

#### GENERAL RULES

Version: January 15<sup>th</sup>  
*(changes compared to 2019 in red)*



*WRO International Premium Partners*





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## Introduction

Robotics is a wonderful platform for learning 21st century skills. Solving robotic challenges encourages innovation and develops creativity and problem-solving skills in students. Because robotics crosses multiple curricular subjects, students must learn and apply their knowledge of science, technology, engineering, math, and computer programming.

The most rewarding part of designing robots is that students have fun. They work together as a team, discovering their own solutions. Coaches guide them along the way, then step back to allow them their own victories and losses. Students thrive in this supportive and immersive environment, and learning occurs as naturally as breathing air.

At the end of the day, at the end of a fair competition, students can say they did their best, they learned, and they had fun.

## Important changes for WRO 2020

Rule	Change
1.1	Remove the restrictions on the controllers.
1.2	Remove the restrictions on the controllers' software.
1.3	Remove the restrictions on the hardware and building systems.
1.4	Remove the restrictions on the material of the robot's elements.
1.7	Remove the restrictions on the electronic components.
1.8	Remove the restrictions on the Adhesive materials
1.10	Remove the restrictions on the hydraulic and barometric equipment.
1.11	Add the restriction on using any communication components.
1.12	Add the restriction on having an emergency button

## Advanced Robotics Challenge Rules

The rules of competition are constituted by World Robot Olympiad Association (WRO).

### 1. Materials

- 1.1. The controller used for the robot can be either Single board computer ([https://en.wikipedia.org/wiki/Single-board\\_computer](https://en.wikipedia.org/wiki/Single-board_computer)) or Single board microcontroller ([https://en.wikipedia.org/wiki/Single-board\\_microcontroller](https://en.wikipedia.org/wiki/Single-board_microcontroller)) with no restriction on brand.
- 1.2. Control software can be written in any programming language – there are no restrictions on a specific language.
- 1.3. สำหรับการแข่งขันในประเทศไทย ทางเรากำหนดให้ผู้เข้าแข่งขันจะต้องใช้ชิ้นส่วนจาก Pitsco Education ชุด Tetrix เป็นโครงสร้างหลักเท่านั้น และสามารถใช้อื่นส่วนจาก LEGO® Education ร่วมด้วยได้
- 1.4. สามารถใช้ชิ้นส่วนที่ทำจาก 3D printer, CNC, อะคริลิก ไม้ โลหะ หรืออื่นๆในการนำมาทำตัวยึดมอเตอร์ เซนเซอร์ กล้อง แบตเตอรี่ เท่านั้น
- 1.5. Teams can use any sensors of their choice – there are no restrictions on brand, function or number of sensors used. Cameras are considered sensors.
- 1.6. Teams can use any electrical motors and servos of their choice – there are no restrictions on brand or number of motors and servos used.
- 1.7. Teams can use any electronic components – there are no restrictions on the type, company, number or the purpose.
- 1.8. Teams can use electrical tape, elastic bands, cable wraps, nylon ties (tie wraps), ...etc. Any adhesive material is allowed to be used for any purpose.
- 1.9. Teams can use any battery of their choice – there are no restrictions on brand, function or number of batteries used.
- 1.10. Teams can use any hydraulic pressure or barometric pressure equipment.
- 1.11. Teams cannot use any kind of RF, Bluetooth, Wi-Fi or any kind of communication components in their robots, if it is built-in the controller, it must be turned off and the judges can inspect the code and the robot in order to confirm that it is not used by any means.
- 1.12. The robot has to have an emergency button that it is visible to judges and it can be pressed at any moment of the match to stop the robot instantly.
- 1.13. Teams should prepare and bring all the equipment, software and portable computers, they need during the tournament.
- 1.14. Teams should bring enough spare parts. Even in the case of any accidents or equipment malfunction, WRO (and/or organizing committee) is not responsible for their maintenance or replacement.
- 1.15. Coaches are not allowed to enter the court to provide any instructions and

guidance during the competition.

- 1.16. Robots may be assembled before the tournament.
- 1.17. Contestants may make the program beforehand.
- 1.18. Safety Glasses must be worn in the Competition Area at all times.

## **2. Regulations about the robot**

- 2.1. The limits applicable to the maximum dimensions of the robot described in the Game rules.
- 2.2. Robots are autonomous. Participants are not allowed to interfere or assist the robot while it is running (performing the “mission”). This includes entering data to a program by giving visual, audio or any other signals to the robot during the match. Teams that violate this rule will be disqualified at that match.
- 2.3. 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.
- 2.4. Any Bluetooth or Wi-Fi function on the controller must be switched off at all times.
- 2.5. For safety reasons, every robot should have an emergency stop switch that is visible and easy accessible. In addition, participants should wear safety goggles inside the competition area.

### 3. Competition

- 3.1. 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.
- 3.2. On the day of the competition, there will be a minimum of 60 minutes of maintenance time before the start of the first round.
- 3.3. During maintenance time, the contestants may 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. Teams are allowed to make changes to the program or to adjust the robot mechanically.
- 3.4. Teams cannot touch the designated competition areas before the start of the maintenance time is announced.
- 3.5. All robots must be placed on the reviewing table for preparatory review (robot-check) after the end of the Practice period. No mechanisms or programs may be modified after this time.
- 3.6. Robots may take part in the competition only after they have passed the robot check.
- 3.7. If the robot does not pass the robot-check by the judges, the robot may not be used in the competition
- 3.8. The competition consists of a number of rounds with maintenance time in between. After each maintenance time, there will be a robot-check time to review the robot’s requirements.
- 3.9. Preparation time before each game may not exceed 90 seconds, and, once started, individual games may not exceed the match time specified in the Game Rules.
- 3.10. **Starting conditions:**
  - 3.10.1. Robot is placed in the starting block totally **SWITCHED OFF!!**
  - 3.10.2. The position of the robot in the starting area must be so the projection of the robot on the game mat is completely within the start area.
  - 3.10.3. Physical adjustments can be made (This is part of the preparation time). 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 on the robot. If a team do enter data through physical adjustments, the team will be disqualified for that round.
  - 3.10.4. Robot is then switched on. Order of switching on. All sub system controllers are switched on first through one switch, then main controller from a second switch. (Only two switches allowed for turning on the robot).
  - 3.10.5. Robot should then be in a waiting state. Waiting for a Start button to be pressed. The Start button could be on the controller or a separately installed Push Button. (Teams could easily add a Push Button and program it accordingly)
  - 3.10.6. Judge gives signal to start robot. Starting button is then pressed and the time for the attempt is started. The robot will have the amount of time to

- complete the challenge that is mentioned in the Game Rules.
- 3.10.7. Pressing of the start button will start the robot action to attempt the competition run and robot should start moving.
  - 3.11. If there is any uncertainty during the starting task, the judges make the final decision. The judges will bias their decision to the worst outcome available for the context of the situation.
  - 3.12. The match will end as described in the Game Rules.
  - 3.13. 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.
  - 3.14. The ranking of a team is decided depending on the overall competition format as described in the Game Rules. If teams still remain tied, ranking will be determined by the following procedure:
    - 1. Sum of the best attempt in the qualification round and the best attempt in the final round
    - 2. The best final round
    - 3. The second best final round
    - 4. The best qualification round
    - 5. The second best qualification round
    - 6. The third best qualification round
    - 7. Time of the best final round
    - 8. Time of the best qualification round
    - 9. Time of the second best final round.

#### **4. Court**

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

#### **5. Prohibited matters**

- 5.1. Destruction or tampering with competition courts/tables, materials or robots of other teams.
- 5.2. Use of dangerous items or behaviors that may create or cause interference with the competition.
- 5.3. Inappropriate words and/or behavior toward other team members, other teams, audience, judges or staff.
- 5.4. Bringing a cellular/mobile phone or a medium of wire/wireless communication into the designated competition area.
- 5.5. Bringing food or drink into the designated competition area.

- 5.6. 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.
- 5.7. Any other situation which judges might consider as interference or violation of the spirit of the competition.

## 6. Fairness

- 6.1. By competing in WRO, teams and coaches accept the WRO Guiding Principles that can be found at: <https://wro-association.org/competition/wro-ethics-code/>
- 6.2. Every team needs to bring a signed copy of the WRO Ethics Code to the competition and hand it to the judges before the start of the competition.
- 6.3. If any of the rules mentioned in this document are broken or violated, the referees can decide on one or more of the following consequences:
  - A team may not be allowed to participate in one or more runs.
  - A team may get up to a 50% reduced score in one or more runs.
  - A team may not qualify for the next round (e.g. in case you have a competition mode with TOP 16, TOP 8 etc.).
  - A team may not qualify for the international final.
  - A team may be disqualified completely from the competition.

## 7. Internet solutions / Duplicate models and programs

- 7.1. If a team is identified as having a solution that is too similar to solutions sold or posted online, and clearly not their own, the team will be subject for investigation and possible disqualification.
- 7.2. If a team is identified as having a solution that is too similar to another solution at the competition, and clearly not their own, the team will be subject for investigation and possible disqualification.