



GLOBAL  
ROBOTICS  
CHALLENGE

 RULE BOOK 2026

# GLOBAL ROBOTICS CHALLENGE

## FI RACING CHALLENGE



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## 1. Technical Introduction:

The F1 Racing Challenge is one of the most exciting and thrilling challenges, combining engineering innovation with the spirit of sports competition.

This challenge is inspired by global Formula 1 racing, offering participants the opportunity to design and build fast, powerful robots capable of competing head-to-head on a specially designed track that simulates real racing conditions.

The competition aims to develop students' skills in mechanical engineering and real-time manual control, with a focus on speed, maneuvering, and driving accuracy. Participants face diverse scenarios including quick starts, sharp turns, performing pit stops, and dealing with competition strategies such as overtaking and collision avoidance.

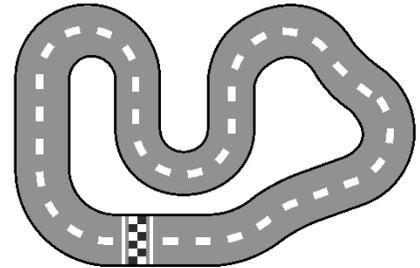
The value of the competition goes beyond testing speed; it is also a comprehensive platform for developing teamwork, driving discipline, and strategic thinking under time pressure. Through a mix of mechanical design, electrical management, and tactical racing, participants refine their practical expertise and move one step closer to the world of professional racing and engineering.

## 2. Team Composition:

- **Team members:** 2 to 4 Students, guided by a Coach .
- **Age Categories :**
  - **Junior Category:**
    - ❖ Ages: 7 to 12 years.
    - ❖ Allowed robots: EV3, Spike Prime, or LEGO NXT.
  - **Senior Category:**
    - ❖ Ages: 13 to 17 years.
    - ❖ Allowed robots: VEX or any type of non-LEGO robots.
  - **Adult Category:**
    - ❖ Ages: 18 and above.
    - ❖ Allowed robots: VEX or any type of non-LEGO robots.

### 3. Track Specifications:

- ❖ **Track dimensions:** Width 100 cm, suitable for side-by-side racing, with a total area of about 5 m × 8 m.
- ❖ **Surface:** Non-reflective wood for better stability.
- ❖ **Start and finish lines:** Clearly marked with visual indicators for recording lap times.
- ❖ **Pit Stop Area:**
  - ❖ A designated area beside the track.
  - ❖ Robots must re-enter the track safely after a stop from the same point.



### 4. Robot Specifications:

- **Dimensions:** Maximum width 30 cm × length 40 cm.
- **Weight:** Maximum weight 4 kg.
- **Control System:** Manual control only via remote controllers.
- Each robot must include an emergency stop button (**Kill Switch**).

### 5. Competition Format:

- **First Round – Qualifiers:**
  - ❖ **Objective:** Complete 3 laps in the shortest possible time.
  - ❖ Two robots compete head-to-head on the track.
  - ❖ The fastest half of the teams qualify for the next round.
- **Second Round – Semi-Finals:**
  - ❖ **Objective:** Complete 3 laps focusing on the fastest average lap time.
  - ❖ New matchups are determined based on the results of the first round.
  - ❖ The fastest robots qualify for the final round.
- **Third Round – Finals:**
  - ❖ **Objective:** Complete 3 laps to determine the champion.
  - ❖ The qualified teams compete head-to-head.
  - ❖ The winner is the robot with the fastest average lap time.

## 6. Race Rules:

- **General Procedures:**
  - ❖ Both robots start at the same time upon the referee's signal.
  - ❖ Each race consists of **3 laps**.
  - ❖ The Pit Stop area can be used, provided the safe exit rules are followed.
- **Head-to-Head Competition:**
  - ❖ **Collision:** Intentional collision is not acceptable. Any deliberate crash leads to penalties or disqualification.
  - ❖ **Overtaking:** Allowed within the width of the track.
  - ❖ **Blocking:** Obstructing the opponent for more than 5 seconds leads to a penalty.

## 7. Penalties:

- **Collision:** Any intentional collision with the opponent or with the track walls results in a **5-second penalty** added to the team's final time.
- **Blocking the opponent:** If a robot blocks its opponent for more than 5 seconds, a **5-second penalty** is applied.
- **False Start:** Any start before the referee's signal leads to a **5-second penalty**.
- **Illegal actions outside the Pit Stop area:** Any unpermitted action outside the Pit Stop results in a **5-second penalty**.
- **All penalties** are added to the team's final race time.

## 8. Scoring System:

- **Evaluation Components:**
  - ❖ **Average Lap Time:** Calculated as the average time to complete 3 laps.
  - ❖ **Penalties:** Additional time from violations.
  - ❖ **Final Result = Average Lap Time + Penalty Time.**

Team	Lab 1	Lab2	Lab3	Avg	Penalties	Final Score
A	25.0	23.5	24.0	24.2	+5	29.2
B	26.0	24.5	23.0	24.5	+0	24.5
C	22.5	23.0	24.5	23.3	+10	33.3
D	25.0	25.5	26.0	25.5	+0	25.5
E	23.0	24.0	22.5	23.2	+5	28.2

## 9. Challenge Phases:

### 9.1 Pre-Competition Submissions:

Teams are required to submit specific documents before the competition day to ensure preparedness and adherence to safety and design standards:

- **Cost Analysis:** A detailed financial report assessing the costs associated with the robot's design and construction. **Points: 20**
- **Technical Report:** A comprehensive document detailing the robot's design, components, and functionalities, including a description of the electrical system (SID). **Points: 50**
- **Safety Document:** Documentation verifying that the robot meets competition safety standards, including fuse calculations for electrical safety. **Points: 15**
- **Total Pre-Competition Submission Score: 85 points**

### 9.2 Challenge Day:

On Challenge Day, teams will participate in the following events:

#### 9.2.1 Safety Check:

1. Each team's robot will undergo a mandatory safety check prior to racing.
2. Robots that do not pass the safety check will be disqualified from competing.
3. Safety Check Score: **15 points**

#### Safety Standards:

1. **Fuse Requirement:** A fuse must be used.
2. **No Sharp Edges:** Robots should not have any exposed sharp edges.
3. **Covered Wiring:** All wiring should be safely covered, with no exposed elements.
4. **Organized Wiring:** Wiring should be neatly arranged to avoid any risks.
5. **Secured Parts:** All parts should be tightly secured, with no loose screws or unsecured components.

## 9.2.2 Mission (Race):

Teams will compete in a series of races, aiming to complete the track in the shortest time possible.

### - Round Structure:

- Each round will be **20 minutes** in total.
- Each lap is allocated **5 minutes** for teams to complete the track.
- **5 minutes** are provided at the beginning for setup and at the end for exiting the track.

- **Objective:** Achieve the lowest time on the track across three rounds.

### - Race Mission Scoring:

The robot with the fastest total time after three rounds will receive the maximum score of **200 points**.

Scores for other teams will be calculated relative to the fastest robot's time, using the following formula:

$$\text{Score} = ( \text{Fastest Robot Time} / \text{Competitor's Time} ) \times 200$$

**Example:** If the fastest robot completes the course in 50 seconds, and another robot completes it in **60 seconds**, the second robot's score will be:

$$\text{Score} = ( 50 / 60 ) \times 200 = 166.67$$

- **Total Mission Score** : 200 points, with each team's score proportional to their lap time relative to the fastest team.

### 9.2.3 Presentation

Teams will present their project, explaining the design, engineering, and decision-making processes.

- **Format:**
  - ❖ **Duration:** 15-minute presentation followed by a 5-minute Q&A with judges.
  - ❖ **Content:** Teams should cover their robot's design, engineering decisions, and safety considerations.
- **Scoring:**
  - ❖ **Presentation & Delivery:** 50 points
  - ❖ **Design & Engineering Evaluation:** 50 points
- **Total Presentation Score:** 100 points

### 9.3 Scoring Summary:

Phase	Criteria	Points
Pre-Competition (Submissions)	Cost Analysis	20
	Technical Report	50
	Safety Document	15
Challenge Day	Safety Check	15
	Race Mission (Relative Scoring)	Up to 200
	Presentation (Delivery)	50
	Presentation (Engineering)	50

## 10. Safety Regulations:

- **Pre-Race Inspection:** Robots must comply with size, weight, and safety standards before racing. Failure results in disqualification.
- **Emergency Protocols:**
  - ❖ Referees have the right to stop any race for safety concerns.
  - ❖ A designated maintenance area is provided for robot repairs between rounds.

# 11. Design Guidelines:

To help teams build high-performance robots for the competition, the following design recommendations are provided. This guidance covers essential aspects of mechanical and electrical design, with an emphasis on safety, efficiency, and race performance.

## 11.1 Mechanical Design Helper:

The following tips are offered to help teams create a strong, efficient chassis for optimal handling and speed on the track:

- **Chassis Design:** Use lightweight, durable materials such as aluminum or carbon fiber to construct the chassis. Ensure that the chassis is structurally sound and capable of withstanding forces from acceleration, braking, and cornering.
- **The steering system:** for the front wheels is crucial for effective vehicle control, stability, and safety. Unlike fixed wheels, which would significantly limit maneuverability. Therefore, it is most likely that a steering system with a servo motor will be used to control the car's direction.
- **Aerodynamics:** Design the robot's body to reduce air resistance, using smooth, streamlined shapes to lower drag and improve speed.
- **Suspension:** Ensure the suspension system absorbs shocks effectively, keeping the tires in contact with the track to enhance handling and stability.
- **Weight Distribution:** Position heavy components, like batteries and motors, strategically for balanced weight distribution, which helps prevent instability during sharp turns.
- **Ground Clearance:** Maintain sufficient ground clearance to avoid scraping the track, while keeping it low enough to ensure stability and prevent tipping.

## 11.2 Electrical Design Helper:

This section provides essential guidelines for selecting, configuring, and maintaining the electrical systems of your car:

- **Battery Configuration:** Select a battery type and configuration (series or parallel) that matches the car's power requirements. The batteries should provide ampere power for both acceleration and endurance.
- **Wiring and Safety:** Secure all wiring and ensure insulation to prevent shorts. Install a fuse after the battery to protect the circuit from overcurrent.
- **Motor and Control:** Choose motors that balance speed and torque for optimal performance. Pair the motors with suitable motor controllers to achieve smooth, reliable operation.
- **Power Management:** Design the power system to maximize energy efficiency, minimizing power losses to maintain performance throughout the race.
- **Testing and Calibration:** Conduct thorough testing of the electrical systems in race conditions and adjust as necessary to ensure reliability and optimal performance.

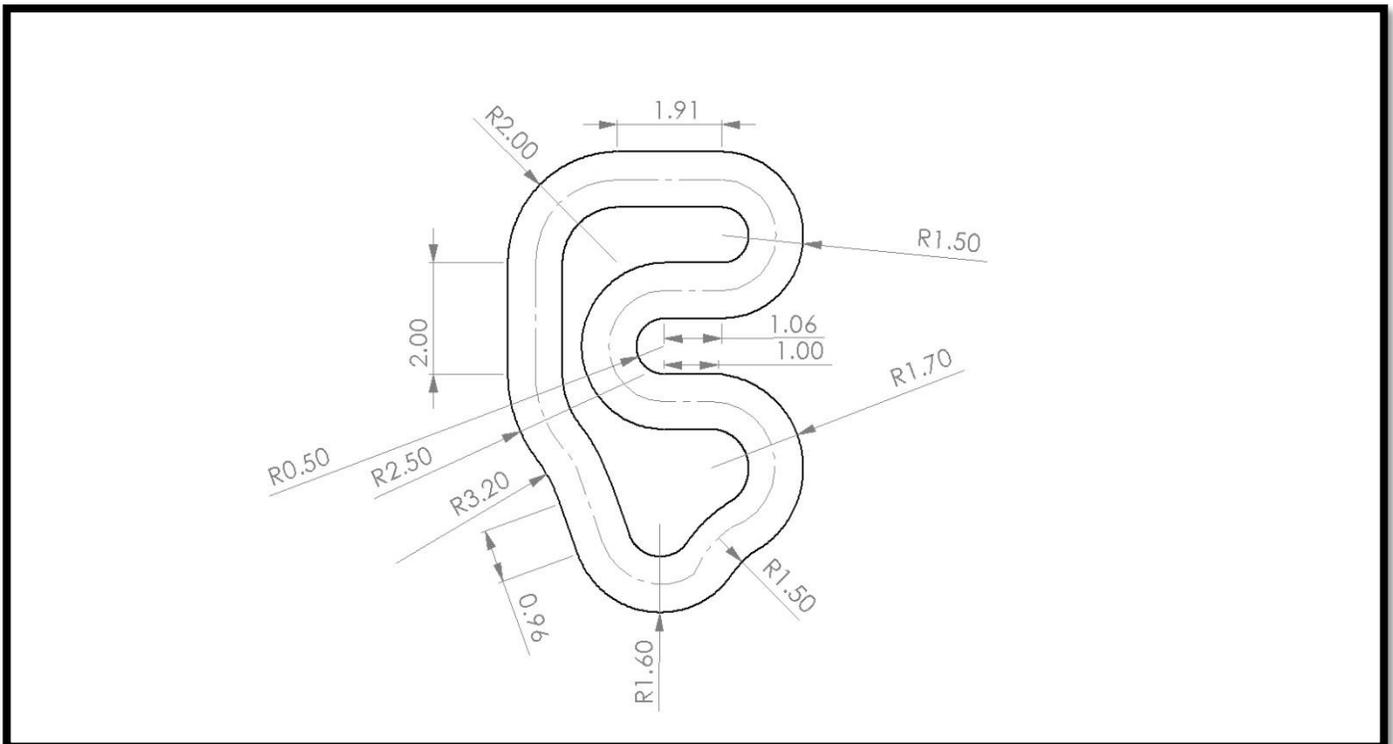
## 12. Safety and Sportsmanship:

- All robots must be safe and free from sharp edges.
- Robots must be stable and secure during operation.
- All teams must demonstrate respect and sportsmanship.
- Any aggressive or unfair behavior may lead to penalties or disqualification.

## 13. Note:

To download the Track click this link:

<https://drive.google.com/drive/folders/1qKm61SZ58x9ddEqQVfE9IJctawyUuIRh?usp=sharing>



Knowing that all dimensions in the pervious figure are in meters.



**Good Luck.**