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2026 InnoBot

**5th Asia-Pacific STEM/AI Technology Innovation**

**Challenge**

**Green Guardians [Singapore Station]**

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"Green Sanctuary" Series — Competition Rules V1.0

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## 1. Competition Overview

Earth is our shared home. Rapid modernization has intensified environmental pollution, resource waste, and climate change, threatening ecosystems.

To address global sustainability challenges, this competition cultivates youth awareness of environmental responsibility, innovation, and interdisciplinary collaboration. Participants of the 2026 InnoBot, 5th Asia-Pacific STEM/AI Technology Innovation Challenge will become "Green Guardians". Using AI and robotics to simulate green reconstruction tasks like wind power generation, waste recycling/classification, and tree planting.

Together, we will harness technology to build a cleaner, greener future.  
Together, we will build our Green Sanctuary!

## 2. Participant Guidelines

### 2.1. Participant Requirements

- Teams: Primary School Category (all members must be enrolled in primary school) and Secondary School Category (all members must be enrolled in secondary school).
- Teams from different categories are not allowed to form cross-category teams.
- Each school may enter up to 2 teams.
- Team size: 2–6 students + 1–2 instructors.

### 2.2. Equipment Requirements

- Each team must design 2 programmable robotic vehicles. An AI

Robotic Vehicle (autonomous robot) and a Mechanical Robotic Vehicle (remote controlled robot).

- Each team is allowed 1 backup AI Robotic Vehicle and 1 backup Mechanical Robotic Vehicle.



AI Robotic Vehicle





Mechanical Robotic Vehicle

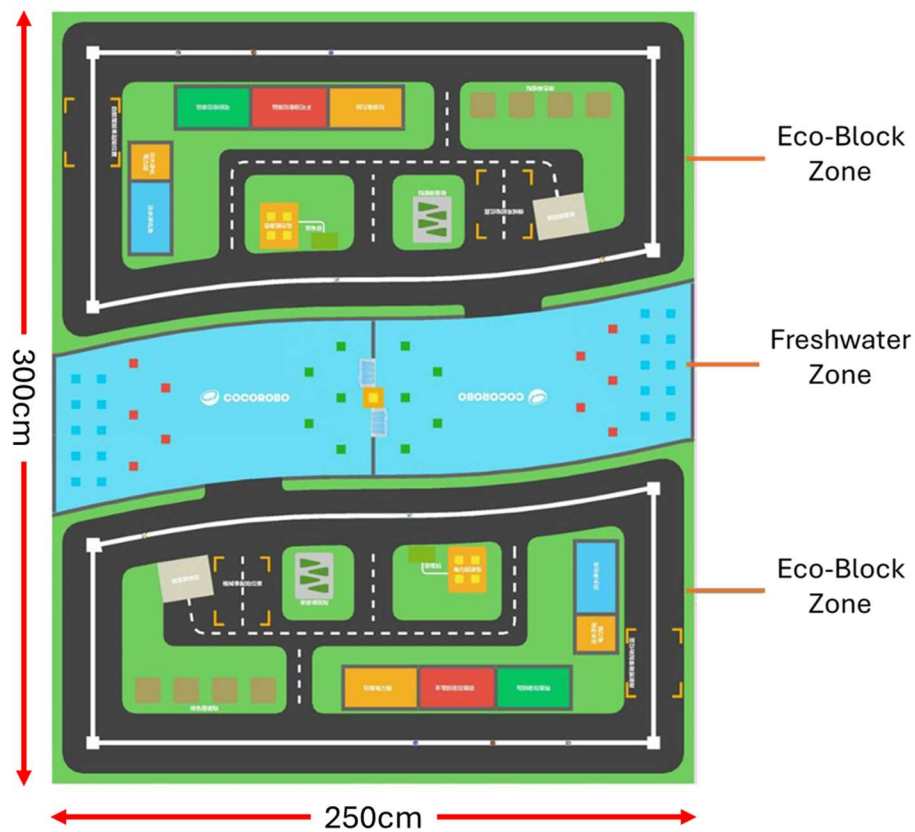
- All robotic vehicles (including batteries) and any other necessary tools must be provided by the participants themselves.
- Teams are allowed to further enhance the design of their own robotic vehicles with the following restrictions:
  - a) AI Robotic Vehicle must be fully autonomous and must not be controlled using any external controller.
  - b) Mechanical Robotic Vehicle must be controlled using the Bluetooth Joystick Controller.
  - c) Maximum voltage for each robot shall not exceed 12V.
  - d) AI Robotic Vehicle may use up to but not exceeding 2 servos and 6 DC motors.
  - e) Mechanical Robotic Vehicle may use up to but not exceeding 4 servos and 5 DC motors.
  - f) Disruptive devices (e.g., lasers, signal jammers) should not

be mounted or used on both Robotic Vehicles.

- g) Both Robotic Vehicles are limited to the following size restrictions, tested via placing an enclosure over the Robotic Vehicles, as shown in the table below.

Robotic Vehicle	Length	Width	Height
 AI Robotic Vehicle	300mm	200mm	160mm
 Mechanical Robotic Vehicle (with claws vertically upright)	220mm	200mm	250mm

### 3. Competition Content



Competition Playfield Diagram


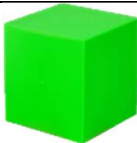


### 3.1. Playfield Diagram

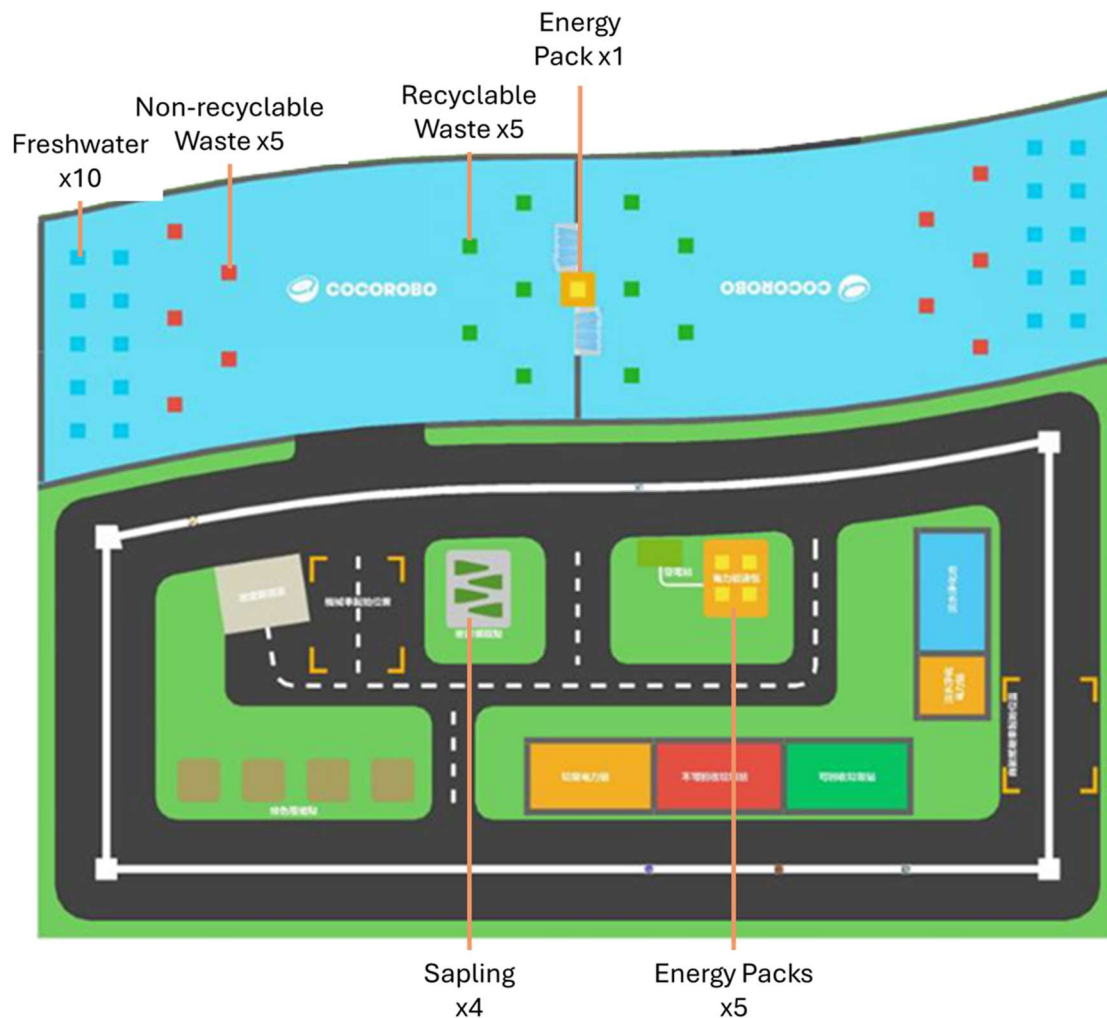
- Each playfield dimension measures 2500mm x 3000mm.
- Each playfield consists of 2 Eco-Block Zones and 1 Freshwater Zone.

### 3.2. Robotic Vehicles

- 1x AI Robotic Vehicle: AI autonomous navigation along the white line in the Eco-Block Zone.
- 1x Mechanical Robotic Vehicle: Remote controlled movement in the Eco-Block Zone and Freshwater Zone.

### 3.3. Scoring Objects (each team)

Objects	Description	Quantity	Score
 Non-recyclable Waste	30mm Red Cube	5	5 each
 Recyclable Waste	30mm Green Cube	5	5 each
 Freshwater	30mm Blue Cube	10	5 each
 Energy Pack	30mm Orange Cube	4	Multiplier
 Sapling	30x30x75 mm Tree Shaped Figurine	4	15 each



### 3.4. Hydropower Rule

- The Hydropower Dam is not working because of all the waste (both non-recyclable and recyclable) that is polluting the Freshwater Zone.
- Upon complete sorting of both non-recyclable and recyclable waste (all 10 cubes), the Hydropower Dam will “charge” the Energy Pack.
- Participants can then pick up the additional Energy Pack from the Hydropower Dam Station using the Mechanical Robotic Vehicle.
- After picking up the additional Energy Pack, the participant’s



Mechanical Robotic Vehicle will also be allowed entry into the opponent's freshwater zone.

#### 4. Competition Tasks

##### 4.1. Overall Requirements

- The duration for each run is 7 minutes. Teams are required to use both AI Robotic Vehicle and Mechanical Robotic Vehicle to complete the competition tasks.

##### 4.2. AI Robotic Vehicle Requirements

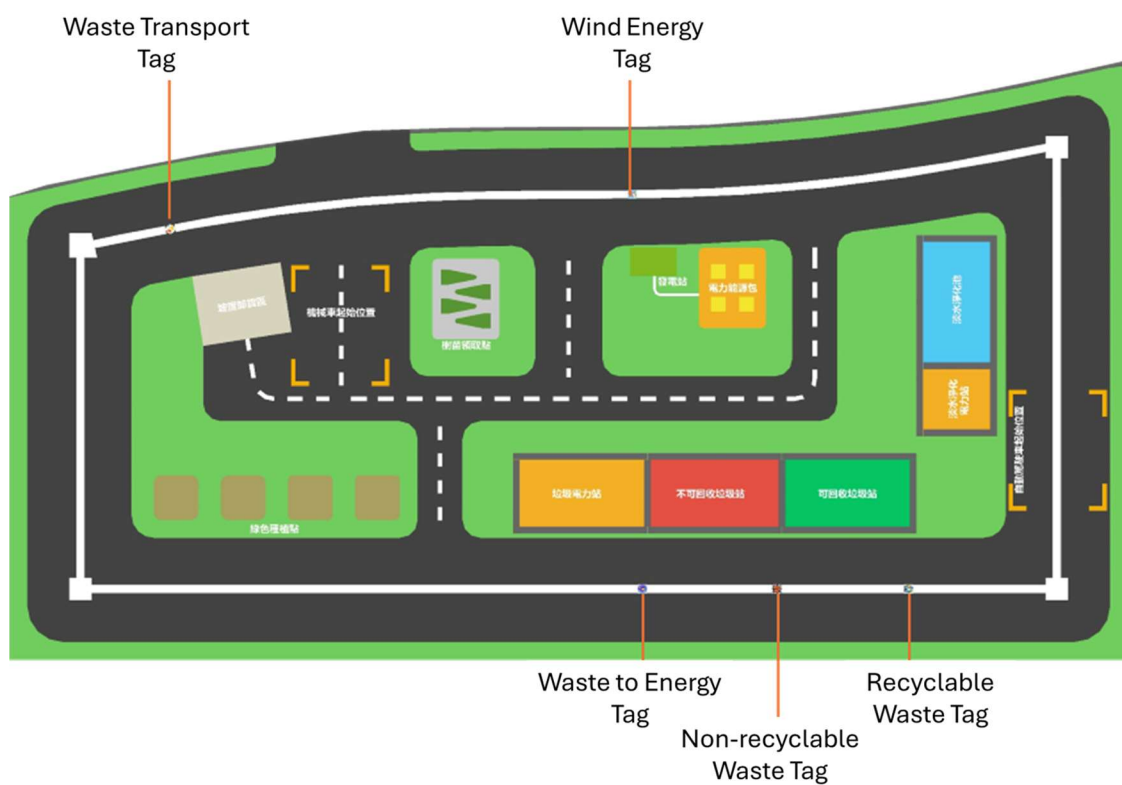
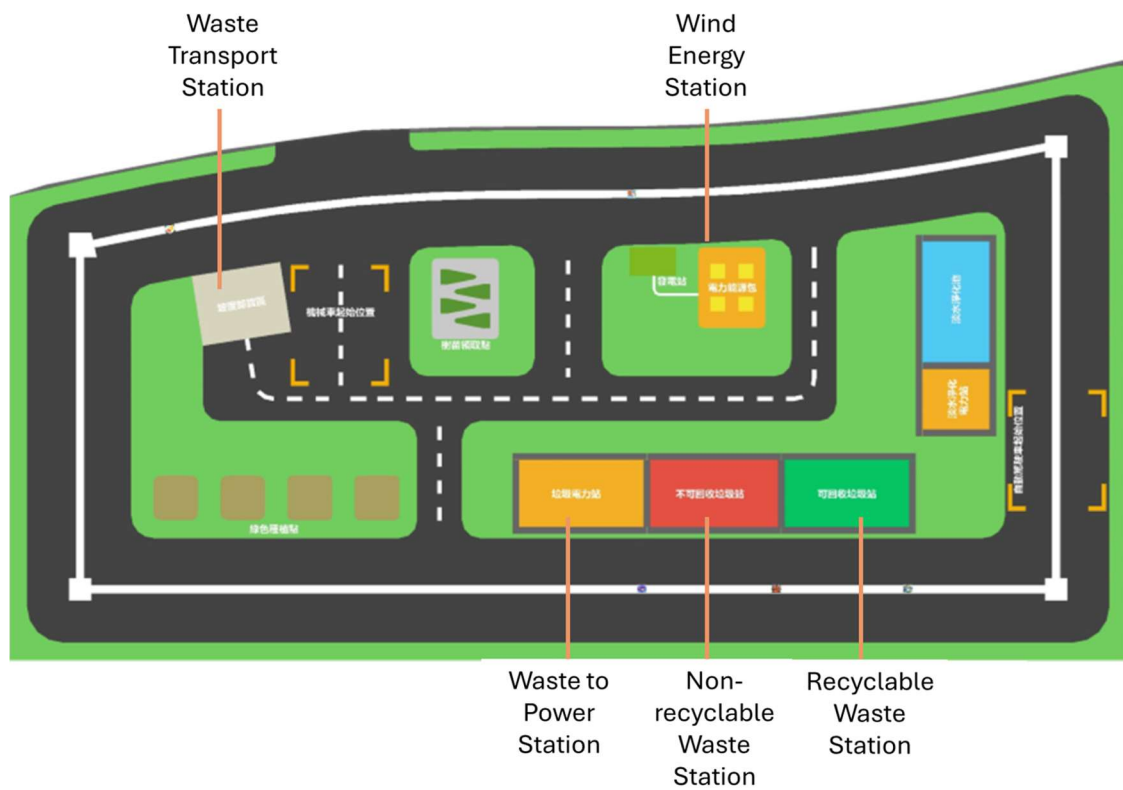
- Fully autonomous robotic vehicle using line following sensors and AI camera.
- AI Robotic Vehicle can only move within the Eco-Block Zone and is not allowed to move into the Freshwater Zone.
- The flatbed on the AI Robotic Vehicle can temporarily store scoring objects that are loaded on by the Mechanical Robotic Vehicle.
- The fan on the AI Robotic Vehicle can turn to spin the turbine.
- The line following sensors on the AI Robotic Vehicle can detect and follow the white path within the Eco-Block Zone.
- The AI camera on the AI Robotic Vehicle can recognize the different image tags which represent different stations along the white path.

##### 4.3. AI Robotic Vehicle Tasks

- Wind Energy Station: AI Robotic Vehicle moves along the white path, recognizes the "Wind Energy" tag, activates the fan

module which then spins the turbine to “charge” the Energy Packs.

- Waste to Energy Power Station: Mechanical Robotic Vehicle picks up and loads the Energy Packs onto the flatbed on the AI Robotic Vehicle. The AI Robotic Vehicle then moves along the white path, recognizes the “Waste to Energy” tag, and deposits the Energy Packs into the Waste to Energy Power Station.
- Waste Transport Station (Non-recyclable Waste): Mechanical Robotic Vehicle picks up and loads the Non-recyclable Waste onto the flatbed on the AI Robotic Vehicle waiting at the “Waste Transport” tag. The AI Robotic Vehicle then moves along the white path, recognizes the “Non-recyclable Waste” tag, and deposits the Non-recyclable Waste into the Non-recyclable Waste Station
- Waste Transport Station (Recyclable Waste): Mechanical Robotic Vehicle picks up and loads the Recyclable Waste onto the flatbed on the AI Robotic Vehicle waiting at the “Waste Transport” tag. The AI Robotic Vehicle then moves along the white path, recognizes the “Recyclable Waste” tag, and deposits the Recyclable Waste into the Recyclable Waste Station



#### 4.4. Mechanical Robotic Vehicle Requirements

- Manually controlled using Bluetooth Remote Control.
- Mechanical Robotic Vehicle can move within both the Eco-Block Zone and the Freshwater Zone.
- The robotic claw on the Mechanical Robotic Vehicle can pick up and load scoring objects onto its own flatbed or onto the AI Robotic Vehicle's flatbed.
- The flatbed can temporarily store scoring objects that the robotic claw on the Mechanical Robotic Vehicle picks up.

#### 4.5. Mechanical Robotic Vehicle Tasks

- Wind Energy Station: Mechanical Robotic Vehicle picks up the “charged” Energy Packs to either load onto the AI Robotic Vehicle or deliver directly onto the Freshwater Purification Power Station.
- Waste Transport Station (Non-recyclable Waste): Mechanical Robotic Vehicle
  - a) picks up and loads Non-recyclable Waste directly onto the flatbed on the AI Robotic Vehicle waiting at the “Waste Transport” tag.
  - b) picks up and loads multiple Non-recyclable Waste onto its own flatbed, then climbs up the slope at the Waste Transport Station to unload the Non-recyclable Waste from its own flatbed onto the AI Robotic Vehicle's flatbed.
- Waste Transport Station (Recyclable Waste): Mechanical Robotic Vehicle
  - a) picks up and loads Recyclable Waste directly onto the flatbed on the AI Robotic Vehicle waiting at the “Waste

Transport” tag.

- b) picks up and loads multiple Recyclable Waste onto its own flatbed, then climbs up the slope at the Waste Transport Station to unload the Recyclable Waste from its own flatbed onto the AI Robotic Vehicle’s flatbed.
- Hydropower Dam Station: When all 5 Non-recyclable Waste and all 5 Recyclable Waste are cleared from the Freshwater Zone and properly sorted into the corresponding Non-recyclable Waste Station and the Recyclable Waste Station, the Mechanical Robotic Vehicle picks up the “charged” Energy Pack to either load onto the AI Robotic Vehicle or deliver directly onto the Freshwater Purification Power Station.
- Freshwater Purification Station: Mechanical Robotic Vehicle picks up the Freshwater and delivers directly onto the Freshwater Purification Station.
- Tree Planting Station: Mechanical Robotic Vehicle picks up the Sapling and delivers directly onto the Tree Planting Station.



## 5. Criteria for Winning

### 5.1. Task Scoring

- Waste Recycling:

Description	Score/Formula
Non-recyclable Waste placed in Non-recyclable Waste Station	5 points per cube
Recyclable Waste placed in Recyclable Waste Station	5 points per cube
Energy Packs placed in Waste to Power Station	Multiplier

*Example: (Non-recyclable Waste Cubes + Recyclable Waste Cubes) x 5 points x Energy Packs*

- Freshwater Purification:

Description	Score/Formula
Freshwater placed in Freshwater Purification Station	5 points per cube
Energy Packs placed in Freshwater Purification Power Station	Multiplier

*Example: Freshwater Cubes x 5 points x Energy Packs*

- Tree Planting:

Description	Score/Formula
Sapling placed standing inside each Tree Planting Stations	15 points per station

*Example: Saplings x 15 points*

In the event where there is more than 1 Sapling inside each Tree Planting Station, it will still be counted as 15 points.

- Bonus Points: 50 bonus points will be awarded if at least 1 Energy Pack is placed in both the Waste to Power Station and Freshwater Purification Power Station.
- Example 1:

Objects	Location	Qty
Non-recyclable Waste	Non-recyclable Waste Station	5
Recyclable Waste	Recyclable Waste Station	4
Energy Pack	Waste to Power Station	1
Freshwater	Freshwater	8

Energy Pack	Freshwater Purification Power Station	2
Sapling	Tree Planting Stations	2

Waste Recycling:  $(5 + 4) \times 5 \times 1 = 45$  points

Freshwater Purification:  $8 \times 5 \times 2 = 80$  points

Tree Planting:  $2 \times 15 = 30$  points

Bonus: 50 points

Total Score: 205 points

## 5.2. Winner Determination:

- The team with the highest score wins the round.
- In the event of a tie score, we will compare tasks points in the following order:
  - a) Waste Recycling Points
  - b) Freshwater Purification Points
  - c) Tree Planting Points

## 5.3. Group Qualifying Stage:

- In this stage, teams will be randomly organized into smaller groups.
- In each individual smaller group, teams will compete against each other, and game points will be awarded for each win, lose or draw. Win = 3 game points, Draw = 1 game point, Loss = 0 game point.
- At the end of the group qualifying stage, the top 2 teams with the highest game points in each group will qualify for the next knockout stage.



- In the event of a tie game points, we will compare other points in the following order:
  - a) Total Task Points
  - b) Total Individual Task Points (Waste Recycling Points → Freshwater Purification Points → Tree Planting Points → Bonus Points)
  - c) Lottery if still unable to resolve

#### 5.4. Knockout Stage:

- In this stage, teams will be randomly paired. Teams will then compete against each other in a single elimination match.
- The team with the highest score wins the round. Winners will proceed to the next round.
- In the event of a tie score, we will compare tasks points in the following order:
  - a) Waste Recycling Points
  - b) Freshwater Purification Points
  - c) Tree Planting Points
  - d) Lottery if still unable to resolve

## 6. Resets & Repairs

### 6.1. Reset Robotic Vehicles

- Each Team is allowed an unlimited number of reset requests per match.
- Team members must verbally request a reset from the nearest referee stating either “AI Robot Reset” or “Mechanical Robot

Reset”.

- Only upon the acknowledgement and approval of the referee can the team member physically pick up and return the Robotic Vehicle to the corresponding starting area.
- Referees will remove any scoring objects from the Robotic Vehicle and place the scoring objects back to their original position on the playfield.

## 6.2. Repair Robotic Vehicles

- If either of the Robotic Vehicle requires repair, team members must first verbally request for a reset from the nearest referee stating either “AI Robot Reset” or “Mechanical Robot Reset”.
- Only upon the acknowledgement and approval of the referee can the team member physically pick up the Robotic Vehicle and bring it off the playfield for repairs.
- There should not be any repairs done on the playfield.
- Referees will remove any scoring objects from the Robotic Vehicle and place the scoring objects back to their original position on the playfield.
- After repairs are completed, teams may then place the Robotic Vehicle at the corresponding starting area.

## 6.3. Backup Robotic Vehicles

- If the team wants to swap either of the Robotic Vehicle with the backup Robotic Vehicle, team members must first verbally request for a reset from the nearest referee stating either “AI Robot Reset” or “Mechanical Robot Reset”.

- Only upon the acknowledgement and approval of the referee can the team member physically pick up and remove the Robotic Vehicle from the playfield.
- The same team member will then place the backup Robotic Vehicle onto the corresponding starting area.
- At any point in time during the match, there should not be more than 1 AI Robotic Vehicle and 1 Mechanical Robotic Vehicle on the playfield.

## 7. Supplementary Rules (Continuously Updated)

### 7.1. Pre-match

- While waiting for the match to begin, Teams must have both their AI Robotic Vehicle and Mechanical Robotic Vehicle placed at the corresponding start areas.
- The Robotic Vehicles must fit within the designated start areas.

### 7.2. AI Robotic Vehicle Off-Track

- In the event if the AI Robotic Vehicle goes off-track, the referee will then physically pick up and return the Robotic Vehicle to the corresponding starting area.
- Referees will remove any scoring objects from the Robotic Vehicle and place the scoring objects back to their original position on the playfield.

### 7.3. Malicious Collisions

- Malicious collisions between Robotic Vehicles are strictly prohibited during the competition.

- If the referee feels that there is malicious collision, the Robotic Vehicle that makes the first contact will be penalized:
  - a) Referee will physically pick up and return the Robotic Vehicle to the corresponding starting area.
  - b) The Robotic Vehicle must stop at the starting area for 15 seconds.
  - c) Referees will remove any scoring objects from the Robotic Vehicle and place the scoring objects back to their original position on the playfield.
- Examples of malicious collisions:
  - a) Team A's Robotic Vehicles collides into Team B's Robotic Vehicle on purpose → Team A penalize.
  - b) Team A's Robotic Vehicles blocking the path of Team B's Robotic Vehicle, causing Team B's Robotic Vehicle to collide into Team A's Robotic Vehicle → Team A penalize.
  - c) Team A's Robotic Vehicle is moving through a narrow path on the playfield and accidentally touches Team B's Robotic Vehicle → No penalty.

#### 7.4. Physically Handling of Robotic Vehicles

- During a match, participants are not allowed to physically touch or pick up their Robotic Vehicles unless they have requested a reset and acknowledgment and approval has been given by the referee.

#### 7.5. Match Duration

- The duration for each match is strictly 7 minutes. Once 7 minutes is up, the match is over. Both teams will need to power off their Robotic Vehicles, remove their Robotic Vehicles from the playfield and await the referee's scoring count.

#### 7.6. Final Interpretation of Rules

- Final interpretation of the rules of the competition lies with the Organizing Committee.