INTERNATIONAL MEB

ROBOT

COMPETITION

17ᵗʰ INTERNATIONAL MEB ROBOT COMPETITION

AUTONOMOUS VEHICLE(AV)

CATEGORY GUIDE

2025

Education, Technology, Production from Roots to the Future

CONTENTS

AUTONOMOUS VEHICLE (AV)

1. INTRODUCTION

The autonomous vehicle category is an image processing competition based on camera. This competition is designed to improve programming skills, to use image processing technology effectively and to provide the vision to use the gains obtained in other fields and to make the process fun. Autonomous AVs in this category stay on the competition track and work to perform the desired tasks and complete the track as soon as possible. In this competition, which makes the process both educational and entertaining, autonomous vehicles stay on the track using only cameras, detect visual elements such as traffic lights, pedestrian crossings and parking areas and perform the desired tasks. Autonomous vehicles demonstrate autonomous decision-making skills by completing tasks in the shortest time thanks to advanced image processing and artificial intelligence algorithms.

2. AUTONOMOUS VEHICLE (AV) SPECIFICATION

In order for AVs to compete in this category:

- AVs must fit comfortably in a 20x30 cm box.

- The height of the AVs cannot exceed 25 cm. There is no weight limit for AVs.

- AVs that do not fit in a 20x30 cm box or exceed 25 cm in height are disqualified.

- The wheel diameter to be used must not exceed 10 cm.

- Since the competition is based on image processing, no other sensor or sensor-like electronic or mechanical device other than a camera may be used.

- There is no limit to the number of cameras to be used.

- If the control card used on autonomous vehicles has modules that provide remote control such as infrared, Bluetooth, radio signals, Wi-Fi, etc., these features will not be used during the competition.. If detected, the competitor will be disqualified.

- There is no limitation on the controller or control card to be used.

- Likewise, there is no limitation for the number of motor and the RPM value of the motor to be used.

- The control systems and algorithms of the vehicles must be run with original software developed entirely by the team. Professional software solutions or standard software of commercial autonomous vehicle kits (e.g. LEGO Spike software, etc.) cannot be used.

3. COMPETITION FIELD

3.1 COMPETITION TRACK SHAPE AND DIMENSIONS

- The track is made of 100 cm wide, 18 mm thick, black mdf plate. There will be dashed and straight road lines on the black background.

- The road edges of the track will be drawn with a white line.

- There will be traffic lights on the roadside at the start. The start of the competition will be by means of these lights.

- At the start, there will be a sensor placed at a height of 5 cm to start the stopwatch that will measure the competition time.

- There will be 20 cm high signs at the roadside for pedestrian crossing, level crossing and overtaking.

- The level crossing and pedestrian crossing will be on a separate decota and will be placed in different places for each competition. The maximum thickness of the decota will be 6 mm.

- For the vehicle overtaking task, 1 vehicle will be used on the track and the position of the vehicle will be re-determined for each competitor. The vehicle will be placed in any of the areas where overtaking is not prohibited. Sample locations of the vehicle to be overtaken are shown in Figure 1. The characteristics of the vehicle are as follows: orange in colour, 20x30x25 cm in size and designed in the form of a taxi.

- In areas where overtaking is prohibited, yellow coloured vehicles with dimensions of 20x45x25 cm will be placed at a random location as shown in Figure 1. These vehicles are designed as taxis or lorries.

- There are 5 zones on the track, as shown in blue in Figure 1. The zones will be determined by signs to be placed on the ground on the roadside.

- At the end of the track, there will be parking areas measuring 28x40 cm with 3 different ground colours. The autonomous vehicle will have to park in the red coloured area among these areas. The ground colours of the parking areas will be on a separate decota and the referee will be able to change the location of these areas in each competition.

- There will be a sensor 5 cm above the ground in the parking area to stop the stopwatch to measure the competition time.
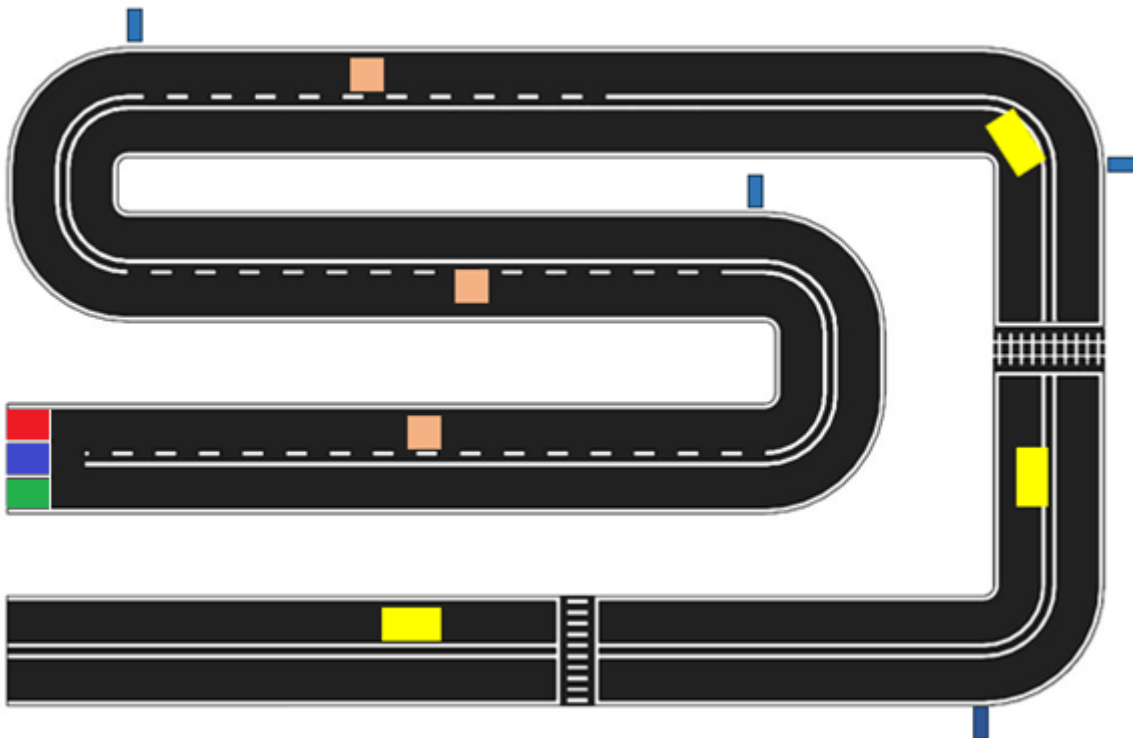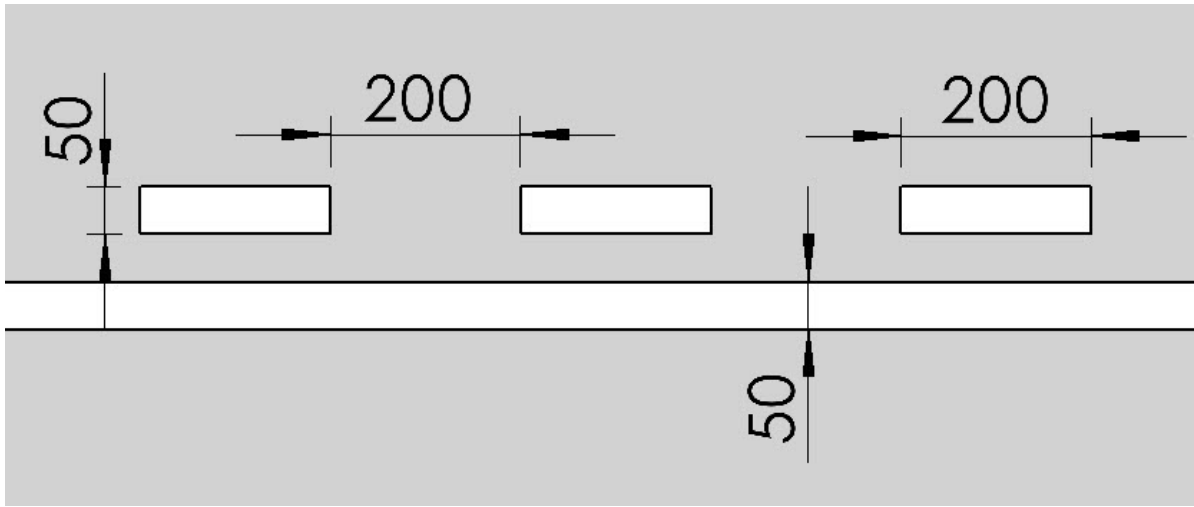

Figure 1: Competition Track
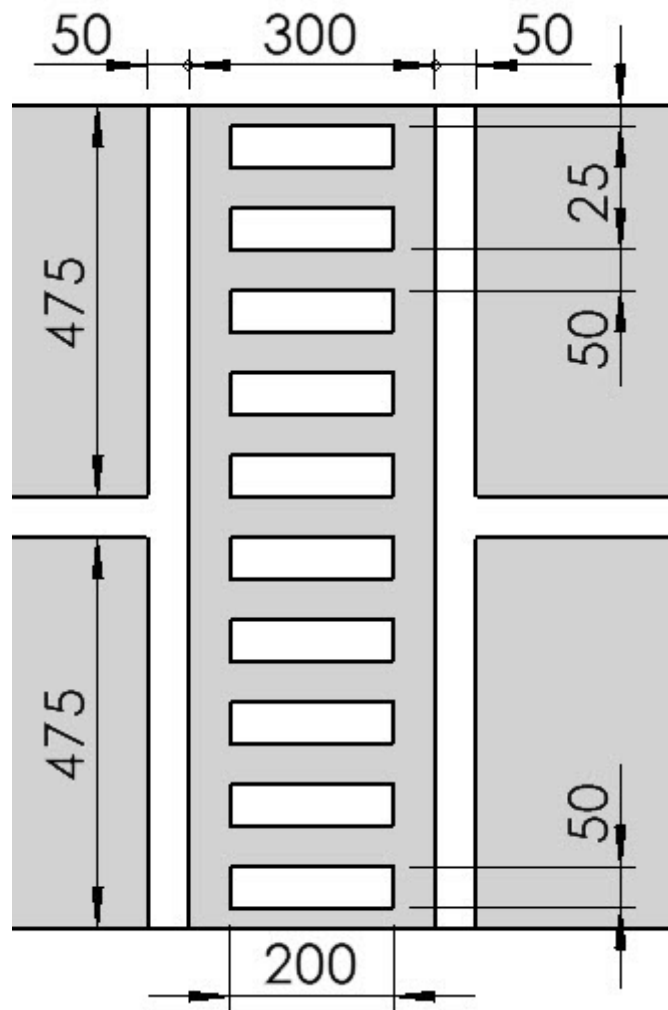
Figure 2: *Road Line dimensions*

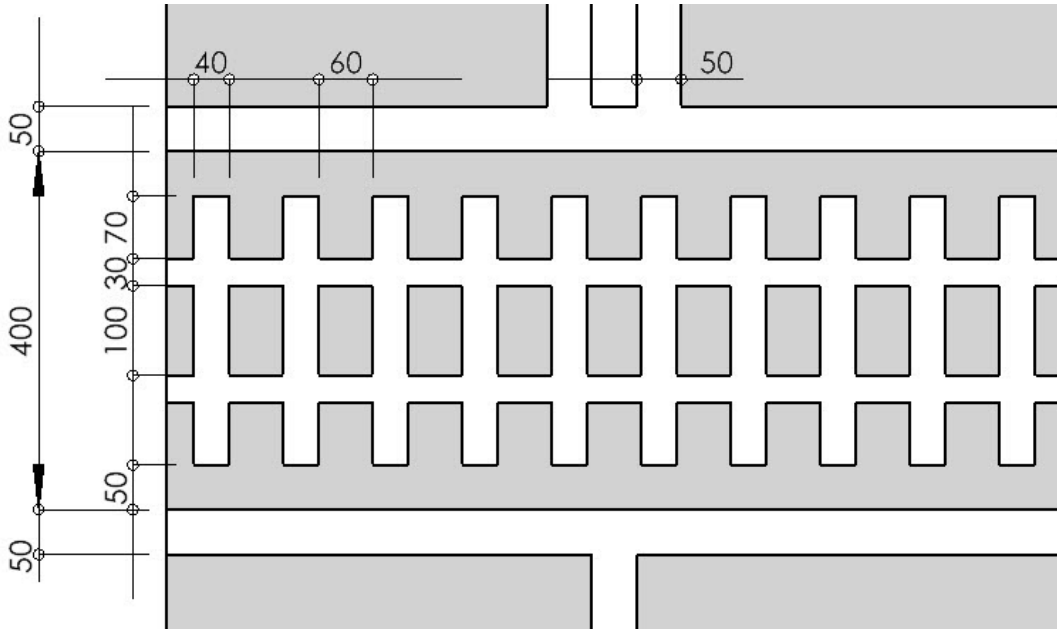**Figure 3:** *Pedestarian crossing dimensions*

Figure 4: Level crossing dimensions
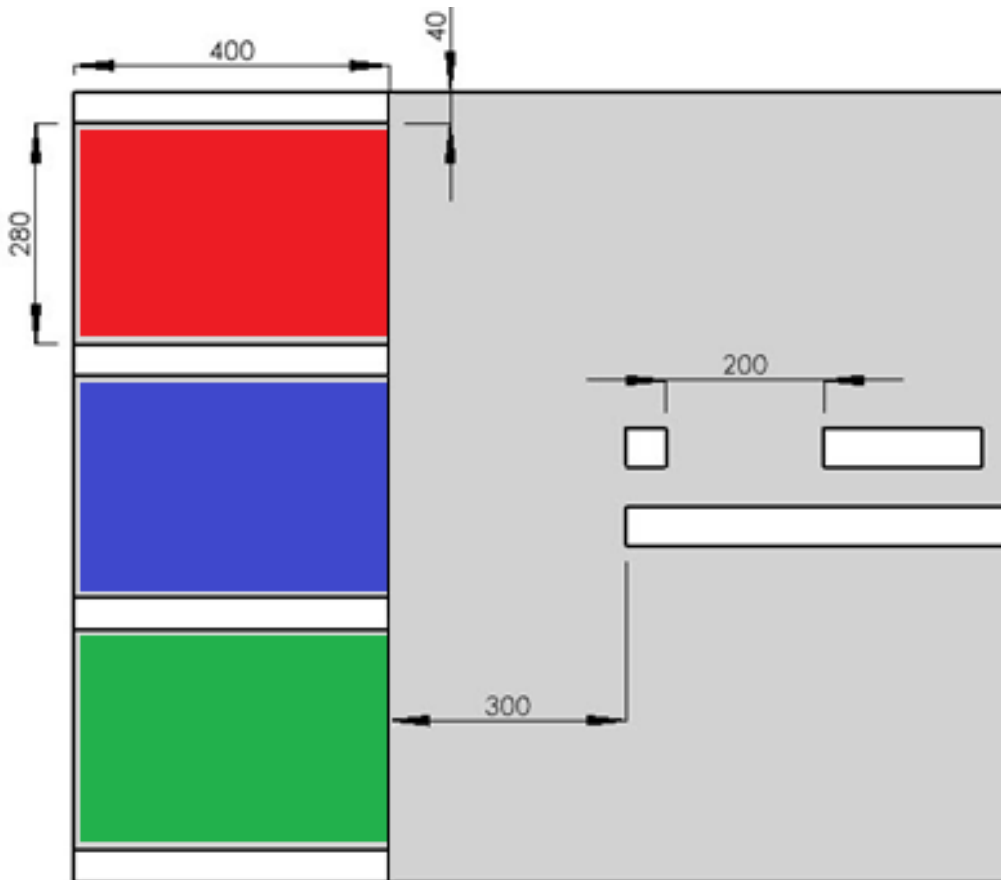
Figure 5: Parking area dimensions
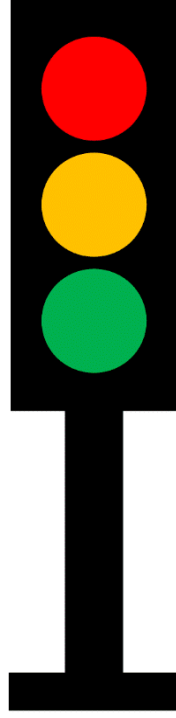
Figure 6: *Traffic lights*
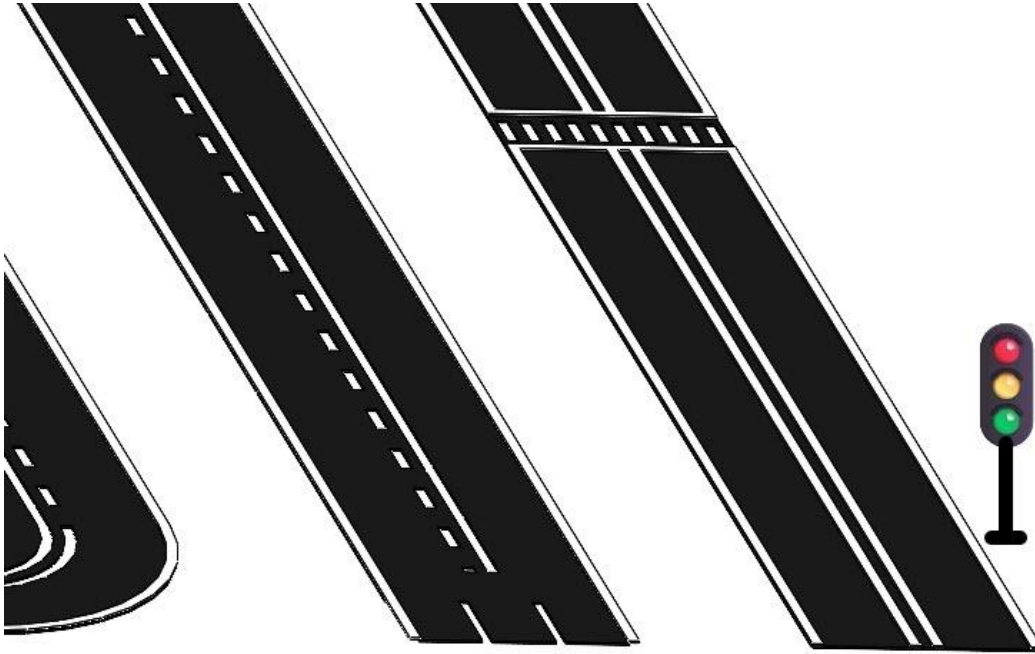
Figure 7: *Starting*
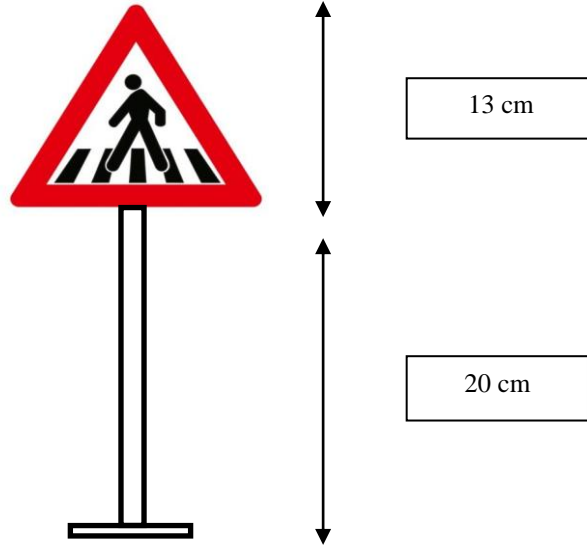
Figure 8: *Pedestrian crossing sign dimensions*
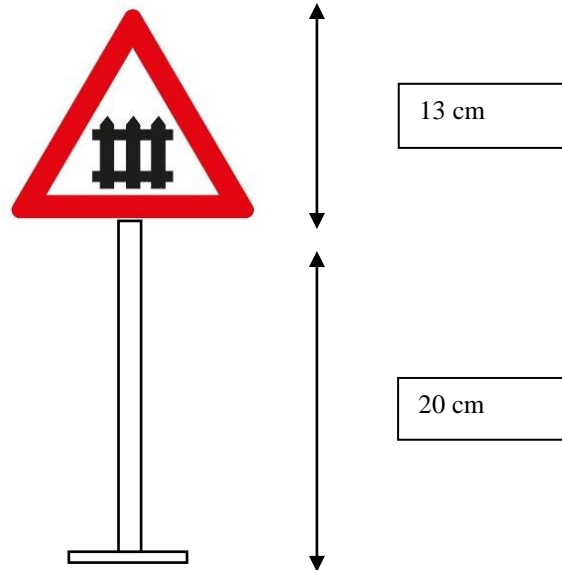
Figure 9: *Level crossing sign dimensions*
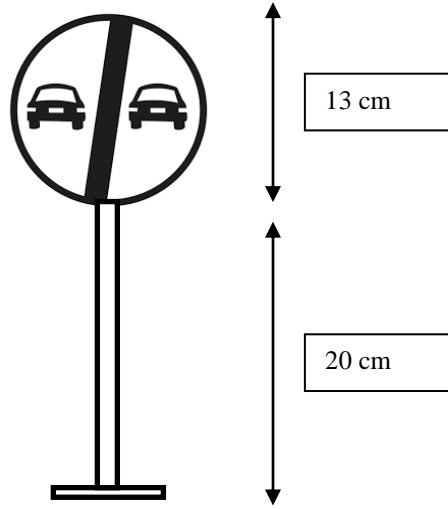
Figure 10: Overtaking sign dimensions

13 cm

20 cm
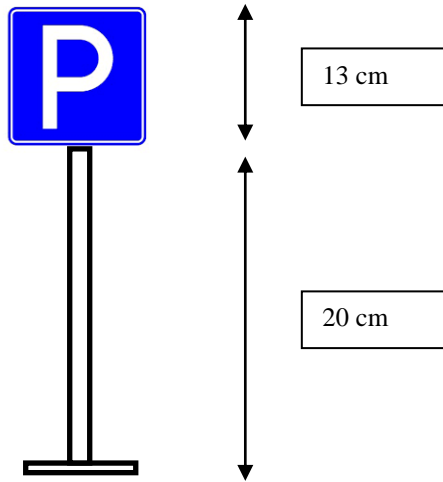
Figure 11: Parking place sign dimensions

13 cm

20 cm

4. COMPETITION FORMAT

4.1 PRE-QUALIFICATION

- There will be no pre-selection in this category.

4.2 TEST STAGE

- Autonomous vehicles will be allowed to test on the track on the first day according to the number of competitors whose applications are accepted.

- Each team will be given equal time during the test phase.

- AV that damage the track during the test phase or during the competition will be disqualified.

4.3 RANKING COMPETITION

- Before the competition starts, team members are asked for information about the software and the autonomous vehicle. The competitor must explain which image processing technique he/she is using. Competitors who do not have information about the autonomous vehicle and software may be disqualified by the decision of technical advisors and referees.

- The competition starts when the AV cross the starting sensor and ends when they pass the sensor in the parking area.

- The AV accepted to the competition area are placed behind the traffic lights and be ready for run by the competitor.

- The traffic light at the start will be red, yellow and green, and autonomous vehicles will start the race within 3 sec. after the light turns green. The times between the lights will be randomised.

- AV that cannot start will be given extra time (duration will be determined competition day) for technical intervention. During this time, they stay in the field, and then they will be asked to start again.

- 50 reward points will be awarded to the AVs that start correctly at the first time. AVs that start correctly the second time will be awarded 25 points. Those who start the autonomous vehicle automatically with the button will be awarded 50 additional points.

- Reward points will not be given to the AV that cannot start properly.

- Autonomous vehicles that fail to start within 15 sec. after the start signal for the second time will be disqualified from the related round.

- AVs will stop at the pedestrian crossing. The distance between where the AV stops and the pedestrian crossing should be maximum 30 cm. It must wait here for at least 5 seconds. AVs that fulfil this task will receive 50 reward points.

- AV will stop at the level crossing. The distance between where the AV stops and the level crossing must be maximum 30 cm. It must wait here for at least 5 seconds. AVs that fulfil this task will receive 50 reward points.

- AV must move to the right lane in the overtaking ban zone and fulfil the overtaking task when the ban ends. AV that fulfil this task will receive 100 reward points.

- There will be 3 parking zone at the end of the track. These parking areas will be red, green and blue. AV will park in the red coloured zone. AV that fulfil this task will receive 100 reward points.

- 50 reward points will be awarded to AV that completes the zones without out of track. In case of leaving from track, 5 reward points will be deducted from 50 points for each leaving. The minimum score will be 0.

- If AV goes out of track, competitor will place it at back on the track parallel to the point from which it left.

- If the AV turns upside down on the track, the rules for leaving track will be applied.

- If the AV remains stationary in a zone for 30 seconds, the rules for running off the track will apply. If the inactivity becomes permanent, the vehicle will be disqualified from that lap by the decision of the referee. Also, millimetre movements of the autonomous vehicle will not be considered as movement.

- If the run-off becomes permanent, the AV will be disqualified from that lap by the decision of the referee.

- In no overtaking zones, if the AV collides with the yellow vehicle in the opposite direction, 25 points will be deducted from the relevant zone completion score. However, the total reward points will not fall below 0

- The maximum completion time of the competition is 5 minutes.

- When AV enters the parking area at the end of the track, the stopwatch will stop and the AV's competition time will be determined.

- When the competition is over (Finishing time coefficient = (5*60-finishing time (sec)) is calculated and added as award points.

- At the end of the ranking competitions, AVs are ranked with their total points at the end of the competition.

- Total score = calculated with award points.

- In case of equality, AVs are ranked according to the time to finish the competition.

- The AVwith the lowest time in the ranking is declared the first.

- After the number of autonomous vehicles is determined, it will be determined how many laps the AV will compete. In case autonomous vehicles compete two or more times, the total score will be calculated by adding the lap scores.

5. WARNINGS TO THE COMPETITORS

- The general rules regarding the competition applications and the Autonomous Vehicle category are included in the "Application Guide". The Application Guide must be read before making an application.

- Competitors called to game area are not given additional time to charge their batteries.

- No permanent trace or marking can be left on the track and it cannot be damaged. AVs that damage the track are disqualified.

- AV can use an energy source such as a battery or battery group. Liquid or flammable energy sources cannot be used.

- Competitors, after the first competition; they can change the tyre wheel or battery on the AVs. They cannot make any other changes on the AV. In all physical appearance changes such as changing the AV body, the AV is disqualified.

- The AV will be disqualified if the QR code pasted on the registration desk during the competitions is removed, replaced and the QR code is damaged.

- AVs that do not match the competitor AV photos on the referee desk are disqualified.

- When the electronic circuit components need to be replaced, the same type of components can be replaced in the same place. The QR code must not be damaged during the replacement of the components. Otherwise, the AV is disqualified.

- The QR code must be affixed to the AV body. It should not be pasted on removable materials. In such cases, the referee disqualifies the AV in case of a problem with the AV.

- Objections made during the competitions due to illuminated marquees, cameras, cameras and lighting around the track will be deemed invalid.

- Changes can be made to the track dimensions during the construction phase without disturbing the general structure.

- The Competition Organising Committee has the right to make changes in the manual when it deems necessarY.

6. CONTACT

Competitors are required to ask their questions by selecting their categories from the information menu after logging into the "robot.meb.gov.tr" system. Questions other than category messages will not be answered. The responsibility in this regard belongs to the contestant.

No	Robot	starting	pedest cross	level cross	over taking	parkin	finish the zones				timing coefficiant	total score	time
		50/25+50	50	50	100	100	(50)-(hit x5)				(5*60-time)		
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													

Tablo 1: *Scoring table*