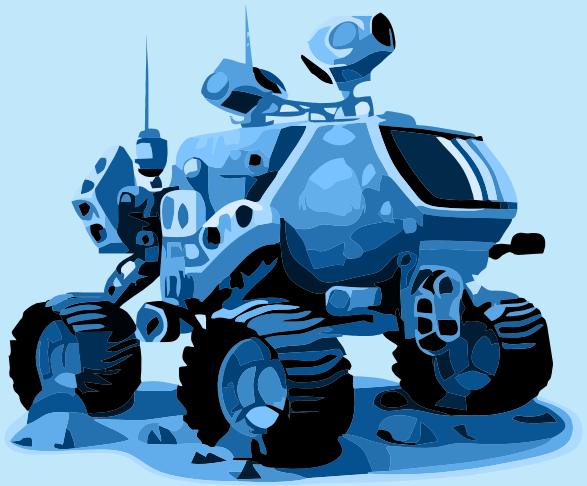
STEAM AZERBAIJAN

SAF 2025 INTERNATIONAL
STEAM AZERBAIJAN FESTIVAL



MECHATRONICS

CATEGORY

FINAL STAGE RULES

BAKU 2025

1.Introduction

1.1. Mechatronics is one of the leading branches of advanced engineering in the modern world. Depending on continuously improving technology and being associated with various fields and sectors, mechatronics is applied in the production of innovative devices used in almost every home.

1.2. Some products of mechatronics engineers include healthcare robots, agricultural robots, automated industry, electromechanical systems, flight robots, vision robots, smart weapon industry systems, space engineers, industrial robot arms, etc.

1.3. For the design and modeling part of mechatronics engineering, the use of 3D printing and CNC laser machines is now accessible to everyone. These modern devices provide specialists the opportunity to create models of any desired size and shape. Additionally, "low tech" activities, known as low-level engineering operations, are also one of the important branches for mechatronics.

2.Participation Conditions

2.1. **Each participant must thoroughly and carefully familiarize themselves with the provided PDF instructions. Participants are responsible for any shortcomings and resulting consequences due to incomplete knowledge of the rules.**

2.2. Teams must consist of one mentor over the age of 18 (any person) and 2 participants aged between 13-17.

2.3. A participant can only be part of one team.

2.4. After the registration period ends, a selection phase will be conducted among the teams to determine those advancing to the finals. The conditions and timing of the selection phase will be announced after the registration ends.

2.5. Anyone who wishes to participate in the competition may join under the given conditions and must adhere to the rules set for the preparation of the robot vehicle (Rover).

3. Application Method

Applications will be accepted through SAF's official website (https://saf.steam.edu.az/).

4. Technical Requirements for the Robot

4.1. To participate in the competition, the assembled robot vehicle (Rover) must meet **all the requirements** listed below.

4.2. The dimensions of the Rover must not exceed the specified limits:

4.3. **Maximum length (body part):** 40 cm. Maximum width: 40 cm. Maximum height: 50 cm. (**Figure 1**). The **total length** including the arm can be up to 55 cm. No additional wheel(s) can be installed on the Rover's arm part.

4.4. The weight of the Rover must not exceed 4 kg.

4.5. The number of wheels on the Rover must be either 4 or 6.

4.6. The maximum rotational speed of the motors must not exceed 80 rpm (revolutions per minute).

4.7. The diameter of the wheels must not exceed 95 mm.

4.8. The materials used for the body must be designed and prepared by the team.

4.9. **Pre-made body parts are not accepted.**

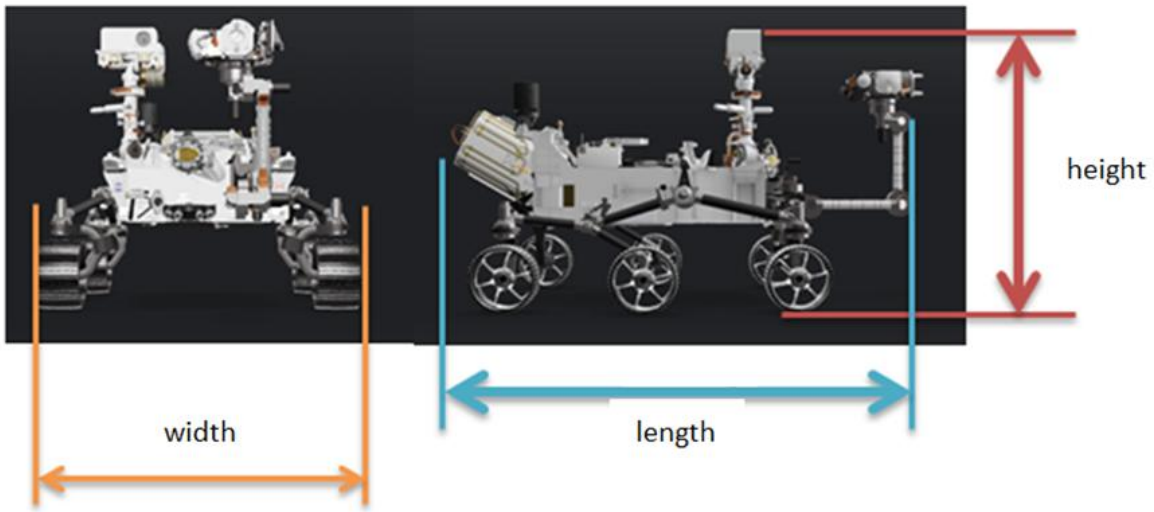
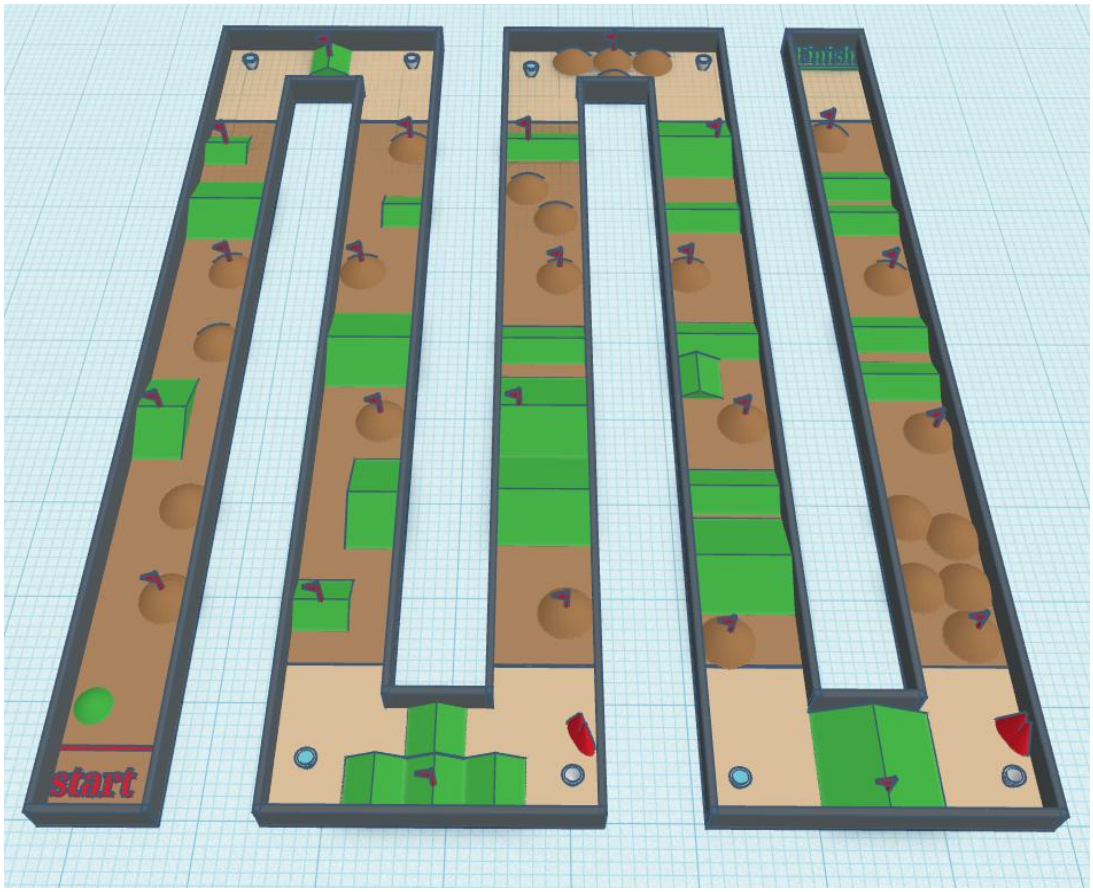
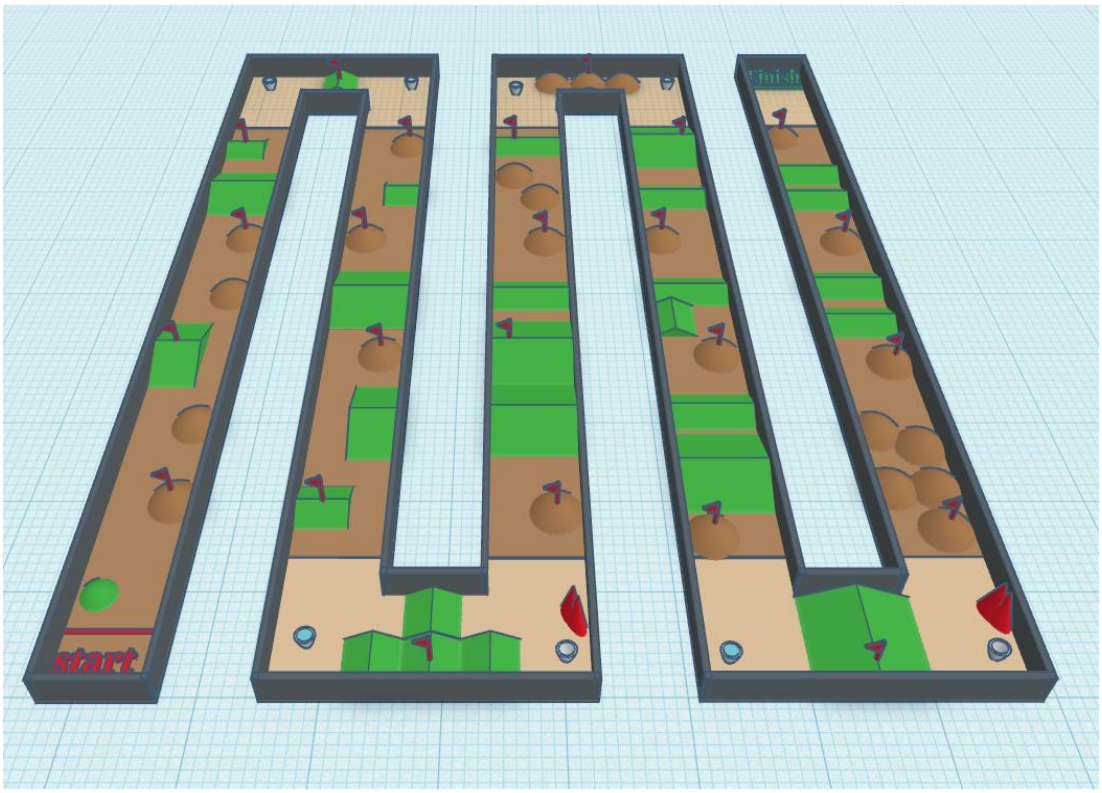


Figure 1.

5. Field Appearance and Dimensions

5.1. 3D view of the field:





5.2. Field Appearance and Dimensions:

5.2.1. The overall dimensions of the field and the height and angle of each obstacle from 1 to 54 are shown in **Table No. 1 and Table No. 2**.

5.2.2. The height of the field edges is 30 cm.

5.2.3. Out of the 8 blue containers shown on the map, 4 are filled with water and 4 are empty..

5.2.4. The obstacles on the field are made of carpet material.

5.2.5. The 2 red objects shown in the field are artificial flames.

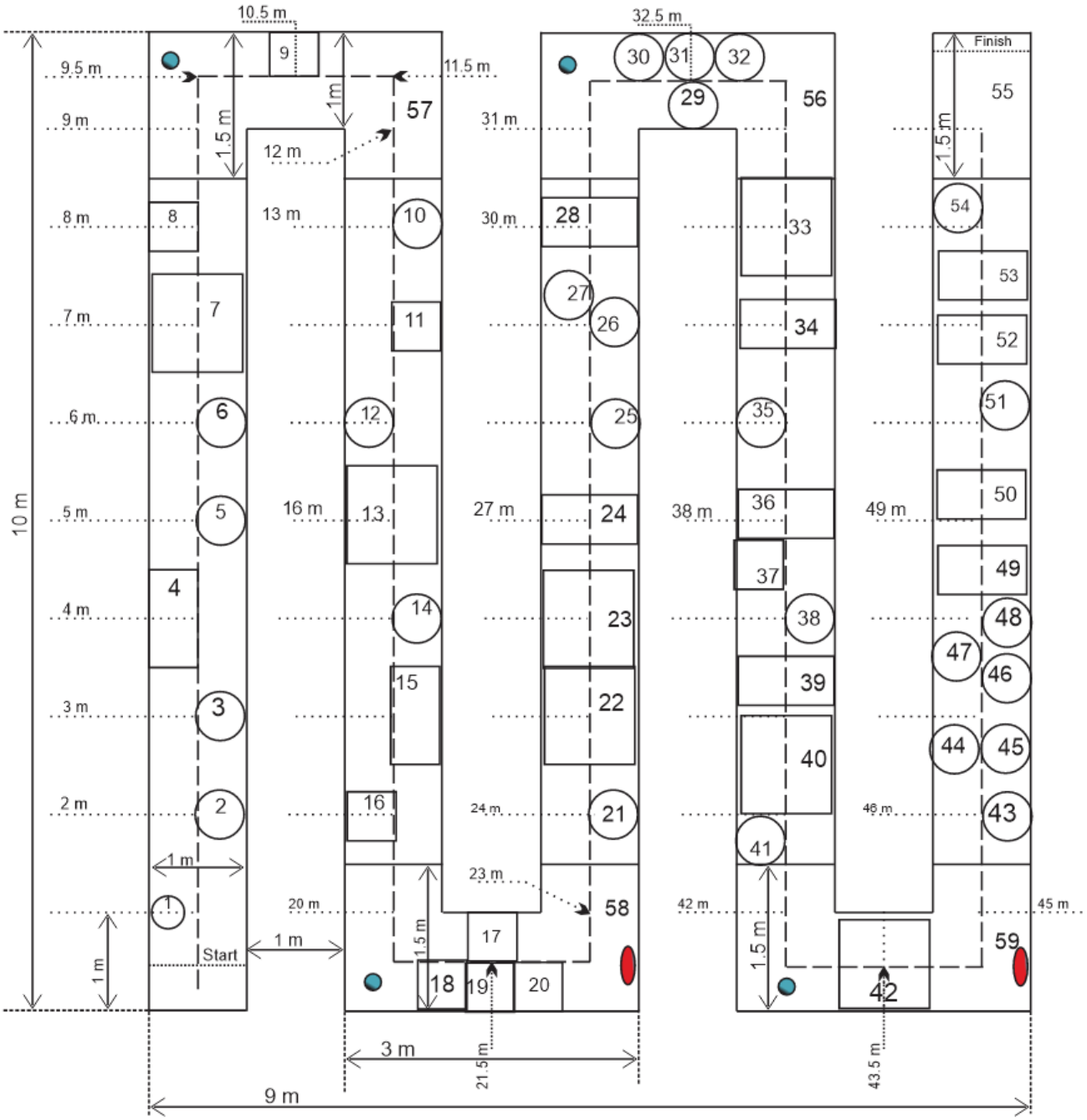


Table No. 1

Cədvəl № 1

nömrə	hündürlük(sm)	dərəcə	x - y ölçü
1	10	30	17
2	15	30	26
3	15	30	26
4	18	20	50-100
5	15	30	26
6	15	30	26
7	18	20	100-100
8	11	25	50-50
9	11	25	50-50
10	15	30	26
11	11	25	50-50
12	15	30	26
13	18	20	100-100
14	15	30	26
15	18	20	50-100
16	11	25	50-50
17	11	25	50-50
18	11	25	50-50
19	11	25	50-50
20	11	25	50-50
21	15	30	26
22	18	20	100-100
23	18	20	100-100
24	11	25	50-100
25	15	30	26
26	15	30	26
27	15	30	26

Table No. 2

Cədvəl № 2

nömrə	hündürlük(sm)	dərəcə	x - y ölçü
28	11	25	50-100
29	15	30	26
30	15	30	26
31	15	30	26
32	15	30	26
33	18	20	100-100
34	11	25	50-100
35	15	30	26
36	11	25	50-100
37	11	25	50-50
38	15	30	26
39	11	25	50-100
40	18	20	100-100
41	15	30	26
42	18	20	100-100
43	15	30	26
44	15	30	26
45	15	30	26
46	15	30	26
47	15	30	26
48	15	30	26
49	11	25	50-100
50	11	25	50-100
51	15	30	26
52	11	25	50-100
53	11	25	50-100
54	15	30	26

6.Rules of the Final Stage

6.1. The competition consists of two stages.

6.2. **In the first stage**, teams must present their robot (Rover) in the Jury evaluation room. Teams should provide detailed information about the Rover they have prepared. Scores given by the jury according to the presentations and design will be accumulated during the competition.

6.3. ***An additional winner will be selected for Presentation and Design nominations.***

6.4. **The second stage of the competition** will be held on a carpeted field. The width of the competition area is 1 meter, and the total length of the course (including 4 loops) is 54 meters.

6.5. During the competition, each team will compete in the main arena with a time limit of (4 minutes and 40 seconds). Within this time, the team must try to reach the finish line by completely overcoming all obstacles and completing the tasks.

6.6. Each team will have 3 attempts in the competition, and the results (scores) of each attempt will be recorded. The highest score obtained from one of the team's 3 attempts will be considered as the final score. ***In case of teams achieving the same highest results, other attempts, time, jury evaluation scores, and penalties will be taken into account.***

6.7. Teams finishing the competition faster than the given time will receive additional points for the remaining seconds.

6.8. The competition starts after the referee gives the start command. The Rover must be controlled manually using a wireless remote control. If the Rover crosses any obstacle during the race, or if it stops, one of the team members may move the Rover one meter back from where it stopped and continue the race. **Points will be deducted** from the team's score in this case.

6.9. During the competition, if any element goes out of order, it can only be replaced with the same (identical) element.

6.10. The robot must be operated manually by only one team member using a wireless remote control.

6.11. A There are a total of **24 flags** set up on the race course. Rover can earn extra points by crossing these flags. Each flag crossed gives the team 10 points. A team that crosses 20 or more flags will receive an **additional** 20 points. For each flag missed, **5 points** are deducted from the team's score.

6.12. 8 water containers are placed in the competition field, and the team's robot must check whether there is water in each container or not using an electronic device installed on the robot. If the device can measure water, the team is awarded (**37.5) points**. 20 points **will be added** to the score of the team that successfully measures 3 or more water containers. For each missed water container, **10 points** will be deducted from the team's score.

6.13. There will be **two simulated fires** on the field, at which point the team's robot must spray

water to extinguish the fire using an electronic device mounted on the robot. The water spray must be aimed directly at the flames, spraying water outside the flames does not count. For each flame that is not extinguished, **20 points are deducted** from the team's score.

6.14. During the competition, judges will record the distance traveled by the robot, flags dropped, the number of water containers measured, the number of fires extinguished, and the time. The distance is measured from the starting point to the closest wheel of the Rover to the finish line. As shown in the example form in Figure 2, the maximum distances traveled by the robots from the starting point during the given time are 14.7 meters, 9.5 meters, and 10 meters for robot-1, robot-2, and robot-3, respectively.

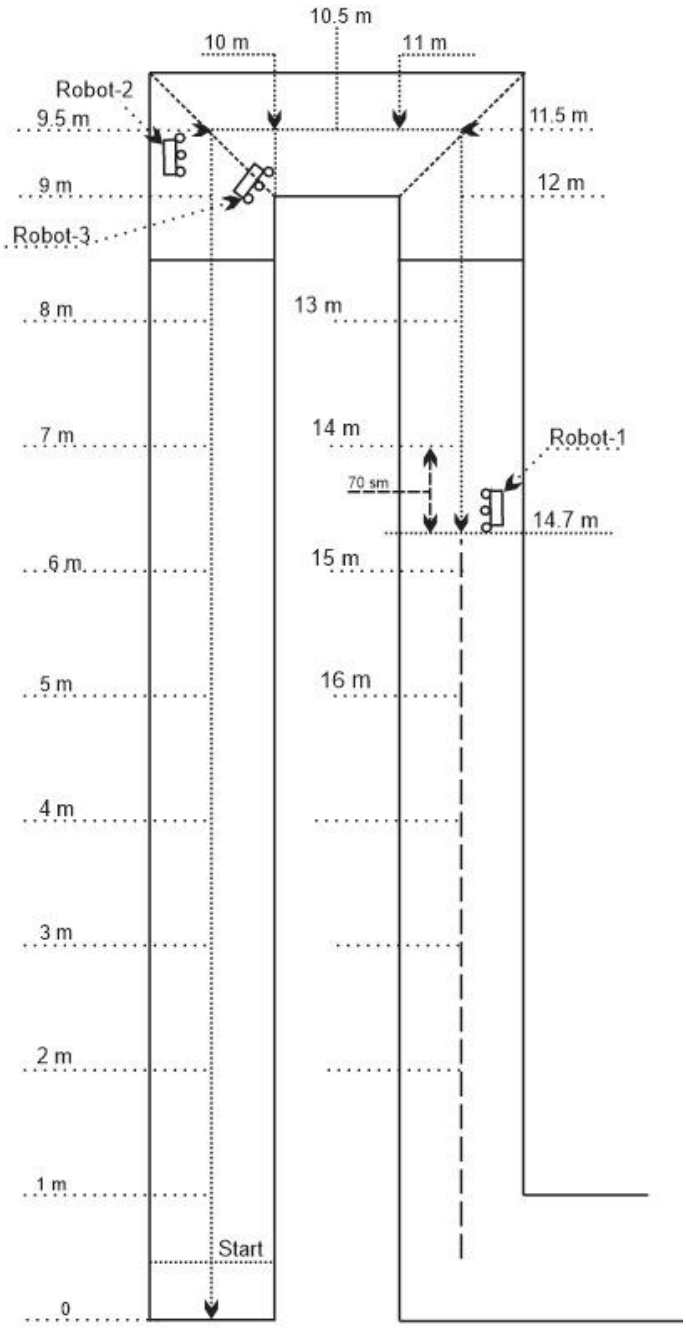

10.5 m
10 m
11 m
Robot-2
9.5 m
11.5 m
9 m
12 m
Robot-3
8 m
13 m
7 m
14 m
Robot-1
70 sm
14.7 m
6 m
15 m
5 m
16 m
4 m
3 m
2 m
1 m
Start
0

Figure No. 2

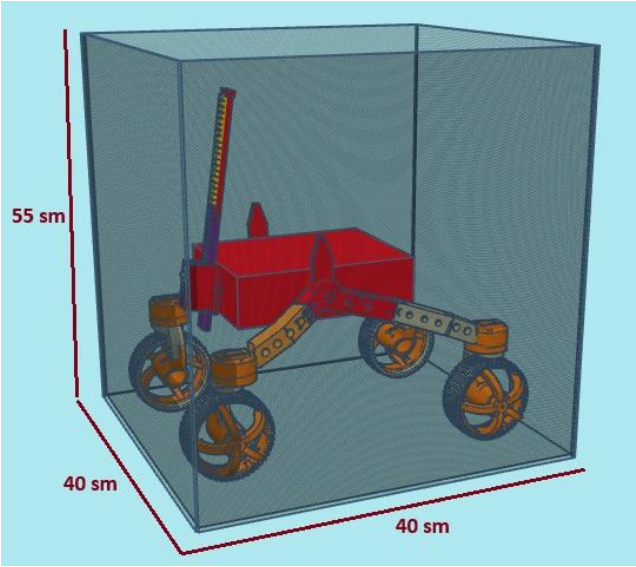
7. Robot Inspection

7.1. Participating teams are advised to inspect their robots (Rovers) within a specified period before the race. If a robot fails to pass inspection within the specified time, it will be disqualified.

7.2. Teams that fail inspection before the race must adjust their robots to meet the requirements and re-test them before the subsequent inspection. If a robot cannot be adjusted to meet the required condition within the specified time, it will be disqualified.

7.3. The robot may be re-inspected during or after the race (before the team leaves the competition area). If technical violations are found with the robot, the team will be disqualified.

7.4. To determine the dimensions of the robot built by the team, the jury will place it inside the box shown below. If the robot's dimensions (height, width, and length) do not exceed the maximum limit, it will be allowed to participate in the competition.



8. Violations Cases

8.1. During the race, participating teams are not allowed to use other teams' robots.

8.2. In case of a dispute, you can approach the judges and/or coordinator to express your opinion.

8.3. During race days and throughout the competition, damaging other teams' Rovers and equipment is prohibited.

8.4. It is prohibited to tamper with and distribute obstacles when entering the field; penalties (deduction of points) will be applied. Obstacles can only be restored with the permission of the race director and judge (if they are seriously disrupted).

8.5. It is prohibited to insult, target, or physically harm other teams and team members during the race.

8.6. Interfering with another team's game, pushing or helping their robot (Rover), is prohibited; penalties will be applied (points deducted).

8.7. Arguing with judges and behaving rudely is prohibited.

8.8. If rule violations are repeated several times, the team will be disqualified.

8.9. Causing damage to any equipment on the competition field may result in your removal from the game. Make sure to read and remember all the rules and act accordingly.

8.10. Decisions made by judges and juries are final in disputed situations and unforeseen force majeure circumstances.

9. Other Requirements

9.1. During the race, team members and the driver can only stay on the edge of the field.

9.2. Your Rover must be fully operational when the race begins. If any problems occur at the start of the race and the Rover cannot be restored within a short period, automatic scoring will be zero, and one attempt will be counted as used. Therefore, ensure that your Rover's battery and other components are in fully operational condition before starting.

9.3. Other teams (members of other teams) can observe you from a distance or from a specially designated area during the race.

9.4. During race days, you may assist other teams if they request help with equipment during break times and idle times.

9.5. During race days, it is possible to consult and share ideas with each other.

9.6. The water container inside the robot must be sealed so that if the robot falls over, the water does not spill onto the electrical components, which could cause a short circuit or fire.

9.7. When you arrive at the race, bring spare parts that comply with the requirements, such as additional wheels, motors, servo motors, and other readily available spare parts. Additionally, you can bring soldering equipment, thermocol, drill, calipers, and other assisting tools so that if any part fails during the race or practice sessions, you can immediately replace it and continue playing!

10. Special Cases

10.1. During the games held during the race, decisions made by the judges are final and cannot be disputed. Participants and mentors risk disqualification if they behave in a manner that delays the race schedule by challenging the judge's decision.

10.2. If, for any reason, the robot does not operate within the given time during the game, the team's attempt will be considered as 0 points, and there will be no additional attempt opportunity for that team.

10.3. If it is noted that a team deliberately strikes another team's robot with the intention of causing it to malfunction, the game will be stopped, and a penalty will be applied to the team that did so.

10.4. In the event of any short-term force majeure incident, the timing of the team's schedule game can be changed with the consent of the organizing committee, along with the location of the subsequent game.

11. Calculation of Points

11.1. Jury Evaluation Criteria:

Criteria	Points
Design	100
Engineering solution	100
Name and purpose of details(*Name and purpose of all elements used in the construction of the robot)*	100

12. Evaluation Criteria for the Final Stage

Criteria	Points
For 1 fully fallen flag	**10**
Distance (per meter)	**5**
Each second of extra remaining time	**1**
Measuring water in one container	**37.5**
1 fire extinguished	**75**

Additional bonus points	Points+
for 20 or more fallen flags	**+20**
For successfully measuring water in 3 or more containers	**+20**
one or more extinguishing fires	**+20**

Penalties (points deducted)	Points-
for every 1 flag that didn't fall	**-5**
if the robot gets stuck, take it and put it back one meter	**-3**
for each water container released	**-10**
For every fire released	**-20**

13. Equipment for making Robot

A 4 or 6 wheel robot should be made using the list below.

Name	Link	Quantity
imax B6 AC+ 80W with T Plug, EU Plug	https://aliexpress.ru/item/1005005397330529.html?sku_id=12000035299342473&spm=a2g2w.productlist.search_results.0.6e2638cer2SM7e	1
Lion 2200MAH battery 11.1V	https://aliexpress.ru/item/1005006007744039.html?sku_id=12000035296338505&spm=a2g2w.productlist.search_results.2.5558230aY4d6ws	1
Flysky FS-TM10 10CH 2.4GHz Remote Controller System with FS-IA10B Receiver Right Hand	https://aliexpress.ru/item/33020965327.html?sku_id=67169875148	1
MG90S 90 - 180 Degree with metal Teeth	https://aliexpress.ru/item/10000293922526.html?sku_id=12000034403282559&spm=a2g2w.productlist.search_results.1.26ae7c99eT4XCB	4
25GA310 DC12V 80RPM/MIN Deceleration Micro Motor	https://aliexpress.ru/item/32945332212.html?spm=a2g2w.orderdetail.0.0.7aaa4aa6clTslw&sku_id=12000021077931583	4-6
M3 Stainless steel Screw Bolt Dia 3mm, Length 20mm and 12mm	https://aliexpress.ru/item/10000183209605.html?sku_id=20000000133592428&spm=a2g2w.productlist.search_results.13.6e7f7092QQFm0W	50
M3 Stainless Steel Nylon Self-lock Hex Nuts Locknut	https://aliexpress.ru/item/1005005442100025.html?sku_id=12000033098393126&spm=a2g2w.productlist.search_results.0.4ca43936oNvEvA	50
BRUSHED 60A WP-1060-RTR ESC	https://aliexpress.ru/item/4000021691430.html?sku_id=10000000049883352&spm=a2g2w.productlist.search_results.9.1a39383chpdxnu	1
40AX2 Dual Way Bidirectional Brushed ESC 6-15V	https://aliexpress.ru/item/4001021957126.html?gatewayAdapt=glo2rus&sku_id=12000032383581785	1
Servo Cable Extension Lead Wire Male to Female 30sm	10pcs/lot 10cm 15CM 30CM 50CM 100CM RC Servo Extension Cord Cable Wire 150mm Lead JR Wholesale | AliExpress	8
Arduino uno\nano\mega	UNO R3 Development Board ATMEGA328P CH340 / ATEGA16U2 Compatible For Arduino with Cable R3/R4 UNO Proto Shield Expansion Board | AliExpress	1
XL4016 PWM Modulation DC-DC 5V-40V to 1.2-36V Buck Converter Adjustable Step Down Power Module Max 8A 200W	https://aliexpress.ru/item/32840326998.html?sku_id=12000021470866128&spm=a2g2w.productlist.search_results.8.7e192c9crSykmN	1
L298N driver board module L298 stepper motor smart car robot breadboard peltier High Power	https://aliexpress.ru/item/1005004866799450.html?sku_id=12000030808636381&spm=a2g2w.productlist.search_results.0.43632bc1sUTrHi	1
Microbit platform	Keyestudio Microbit V2 45 in 1 Sensor Starter Kit For BBC Micro:Bit Kit Programming Kit+45 Projects W/Gift Box | AliExpress	1

Esp32\esp8266	ESP32 Development Board WiFi+Bluetooth Ultra-Low Power Consumption Dual Core ESP-32 | AliExpress	**1**
Arduino\microbit water sensors	Smart Electronics Water Level Sensor Water Sensor Water Droplet Detection Depth for arduino Diy Kit | AliExpress	**1**
Arduino water pump	DC 3V 5V Mini Submersible Pump Water Mute Water Pump For Arduino Uno Water-cooled Mobile Phone Charger Or USB Drive | AliExpress	**1**

NOTE: The organizing committee reserves the right to change the rules at any point in time. The change will however be highlighted on the website https://saf.steam.edu.az