Yantra Autonomous Intelligence Industries(YAII)

Official Competition Rulebook

"Creating Intelligence Robotics Industry in Nepal by 2045"

1. Introduction

Yantra Autonomous Intelligence Industries is an international robotics competition created to encourage innovation in robotics for industrial use. Autonomous legged robots compete in three rounds that mirror real industrial tasks: Precision Motion & Balance (Dancing Moves), Logistics Transit (Racing), and Autonomous Sorting & Inspection (Object Sorting).



The competition brings together students, engineers, researchers and robotics enthusiasts. It aims to show how artificial intelligence, computer vision and automation can improve productivity, safety and accuracy in factories, warehouses and logistics systems.

2. Objectives

- Promote innovation in autonomous robotics for industry.
- Encourage the design of legged (biped and quadruped) robots that can work on uneven or human-built industrial floors.
- Develop practical skills in AI, machine vision, control systems and embedded design.
- Provide a platform for schools, colleges and independent teams to demonstrate industry-ready ideas.

3. Competition Theme

Theme: Disaster Response-Rise after the Shake

As the world faces natural disasters such as earthquakes, industries must be able to recover quickly to protect workers, keep supply chains running and restore the goods and services that communities depend on.

This competition focuses on how industries can better prepare to respond after an earthquake. In these situations, any delay or disorder in safety checks, logistics or the organization of goods can increase the risk of injury, damage and loss, and make it more difficult to restart production and supply the things people need.

In this scenario, storage, production and logistics areas are key components. An earthquake can throw goods, tools and materials all around an industrial space, block the aisles and leave the floor uneven. An effective recovery requires reaching the affected areas quickly, making them safe and putting every item back in its respective place so that work can restart.

In this context, technology can increase response capacity when time is limited and the place is not yet safe for people. Robotics and artificial intelligence can be applied to automate repetitive or risky tasks, improve the movement of goods and support complex operations in unstable, fast-changing environments. For example, after an earthquake, legged robots can walk over uneven floors and fallen items, reach places that are not yet safe for people, move quickly through blocked spaces, and collect and sort scattered goods by color. These solutions do not replace rescue teams and workers, but rather give them vital support when stability, speed and accuracy are essential.



Within this framework, the **Yantra Autonomous Intelligence Industries** competition, organized by the **Robotics Association of Nepal (RAN)**, focuses on addressing these critical issues through robotics applied to post-earthquake recovery in industry.

The competition challenges participating teams to design, build and program autonomous legged robots to simulate real recovery operations. Teams, made up of a maximum of **four members**, will work on arenas that represent key processes of an industry after an earthquake.

The challenge includes three missions: staying stable and moving with control on unstable ground; reaching the damaged area as fast as possible; and finding the scattered goods and arranging them in their respective places.

Mission	**Mission after the earthquake**
Precision Motion & Balance	Stay stable and move with control
Logistics Transit	Reach the damaged area as fast as possible
Autonomous Sorting & Inspection	Arrange the scattered goods in their respective places

Through this scenario, students work on situations related to disaster response in industry, such as moving safely on unstable ground, reaching a place quickly, identifying objects and putting scattered goods back in order. The simulation helps them understand that, in an emergency, every technical decision must contribute to a coordinated, safe and fast response.

Through simulation in a competitive environment, students will be able to explore how robotics can help industries become more resilient and recover faster after a disaster. At the

same time, they will put into practice key skills such as planning, collaboration, creativity, reliability and safety, which are necessary to respond to complex situations in industry and beyond.

Participation in the competition provides direct experience in engineering and programming, and helps students understand how technology can be designed and applied using ethical, social and technical criteria to generate a positive impact on industry and on the well-being of communities.

3. Mission for Teams

MISSION 1: DANCING MOVES (Precision Motion & Balance)

After the earthquake, the ground is unstable, so the robot must show that it can stay balanced and move with control. The mission takes place in an arena of 400 cm × 300 cm, split into two sections of 200 cm × 300 cm, so two teams perform at the same time. The robot starts in its 30 cm × 30 cm start zone at the center of its section. For 2 minutes, it moves and poses, stays balanced and stays inside its own section. The mission is worth 15 points: up to 7 for the performance, and balance points of 8 for a biped robot or 4 for a quadruped robot. The robot loses 1 point for each manual correction after a fall, and 1 point each time it leaves its section.

MISSION 2: RACING (Logistics Transit)

After the earthquake, time is short, so the robot must run along the aisle to reach the damaged area as fast as it can. The track is 400 cm long, made of a 30 cm start zone and a 370 cm race track, and it has three lanes of 90 cm, so three robots race at the same time. The robot starts in its start zone, runs in its own lane and finishes by touching the ribbon, which is 20 cm high, at the end of the track. The mission is worth 25 points. Rank points are 16 for 1st, 14 for 2nd, 13 for 3rd and 12 for 4th, then 1 point less for each lower rank. Locomotion points are 9 for a biped robot and 5 for a quadruped robot. The robot loses 1 point for each manual correction after a fall.

MISSION 3: OBJECT SORTING (Autonomous Sorting & Inspection)

After the earthquake, the goods are spread all around, so the robot must find each object and put it in its right place. The mission takes place in an arena of 300 cm × 300 cm. The robot starts in a 30 cm × 30 cm start zone at the center of one side of the arena. Three objects, red, blue and green (5 cm × 5 cm × 10 cm), stand on the object platform next to the start zone. At the far side of the arena there are three sorting platforms (15 cm × 15 cm × 15 cm), colored red, green and blue, and the referee sets their order. Within 10 minutes, the robot must recognize each color, pick up the object, follow the guide line (straight for 200 cm, then it splits into three) and drop the object on the platform of the same color. The mission is worth 60 points: 20 for each object the robot picks up by itself, or 15 if the team places the object on the robot. A wrong platform costs 5 points, and each manual correction costs 1 point.

Competition Overview

The competition has three rounds with a total of 100 points.

In simple words: Round 1 is **Dancing Moves**, Round 2 is **Racing**, and Round 3 is **Object Sorting**.

Round	Industrial Theme	Task	Points
Round 1:Precision Motion & Balance (Dancing Moves)	Robot stability and controlled movement in a work cell	Perform a two-minute programmed sequence of movements and poses	15
Round 2:Logistics Transit (Racing)	Material movement along a factory aisle	Travel a 3.7 m lane as fast as possible	25
Round 3: Autonomous Sorting & Inspection (Object Sorting)	Vision-based sorting and delivery	Identify, carry and sort colored objects into the correct bins	60
Total			**100**

4. Team Specification

1. Each team may have a maximum of **four (4)** members.
2. Teams may be formed from schools, colleges, or independent groups of robotics enthusiasts.
3. Each team may register and use only **one (1)** robot.
4. Each team must submit a **technical document** before the competition (see Section 14).
5. Each team should nominate one team leader as the contact person for the organizers.

5. Robot Specification

5.1 Locomotion

1. The robot must be **biped (two-legged)** or **quadruped (four-legged)**.
2. **Wheeled robots are not allowed.** Wheels, tracks or any rolling mechanism may not be used for movement.

5.2 Size and Weight

1. The robot height should be 30cm to 60cm in length and height. And its width should be below 30cm.
2. Robot weight must be less than **10 kg**.

5.3 Control and Autonomy

1. The robot must be **fully autonomous**. Manual control, wired or wireless, is strictly forbidden once a run starts.
2. Any microcontroller, microprocessor, sensor or actuator may be used.
3. Any camera and sensors are allowed.
4. The robot carries a **wireless data transmitter module** (used for monitoring and telemetry only, not for control).

5.4 Power

1. The robot may use only **one (1) battery** at a time.
2. Battery voltage must not exceed **24 V**.
3. Batteries must be safely mounted, protected against short circuit, and easy to disconnect.

5.5 Construction

1. **Ready-made toys are not allowed.**
2. Ready-made electronic circuits, modules and development boards **are allowed**.

3. The robot must have an easily accessible **power switch** that can be used by the referee in an emergency.
4. The robot must not have sharp edges, leak liquids, or release anything harmful on the arena.

6. Robot Verification (Homologation)

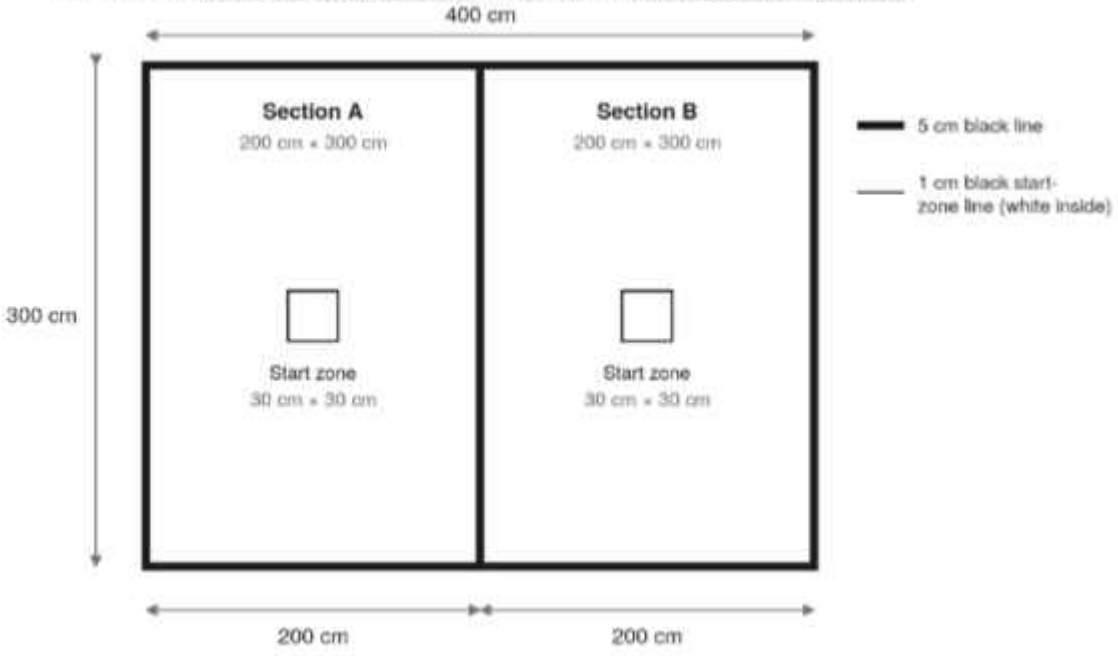
1. Every robot must be verified by the organizers **one week, or 2-3 days, before the competition**.
2. Teams should bring their robot to the office of the **Robotics Association of Nepal (RAN)** for verification.
3. Teams located far from the valley may be verified **virtually** (video call and photo or video evidence).
4. A robot that is not verified **cannot participate**.
5. **After verification, the design of the robot must not be changed.** Only repairs of the same parts and battery charging are allowed.
6. A non-verified (non-homologated) robot found on the field will be removed immediately.

7. Arena Specification

All arena floors are smooth and white. All dividing and path lines are black.

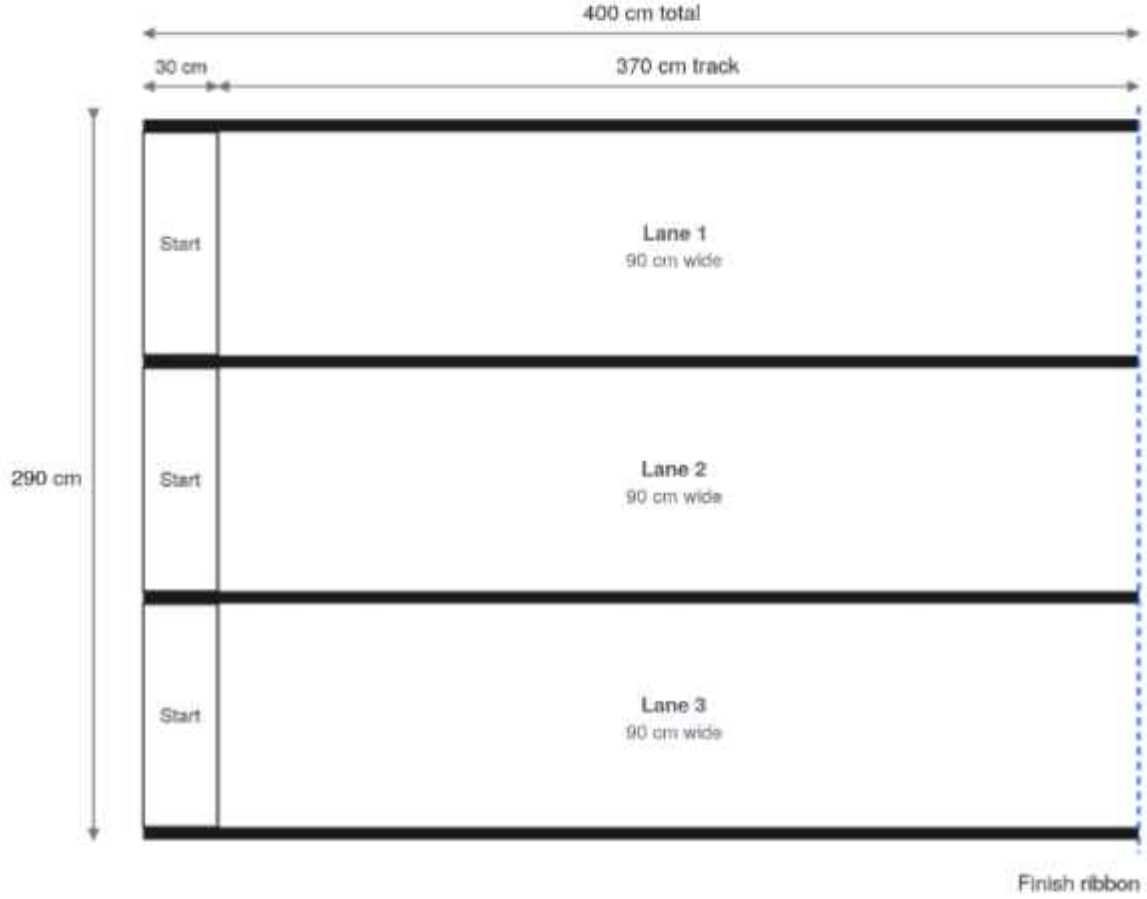
7.1 Round 1: Precision Motion & Balance (Dancing Moves) Arena

- Size: **4 m × 3 m**, smooth white floor, **not enclosed** by walls.
- The arena is divided into **two equal halves** by a **5 cm black line**. Each team gets its own section of about **2 m × 3 m**.
- The whole arena is also bounded by a **5 cm wide black line**.
- The **starting zone** is a **30 cm × 30 cm square** marked with a **1 cm thick black line**, at the **center of each section**.
- The robot must show its moves **inside its own 2 m × 3 m section**.
- Two teams perform at the same time, each only inside its own half.



7.2 Round 2: Logistics Transit (Racing) Arena

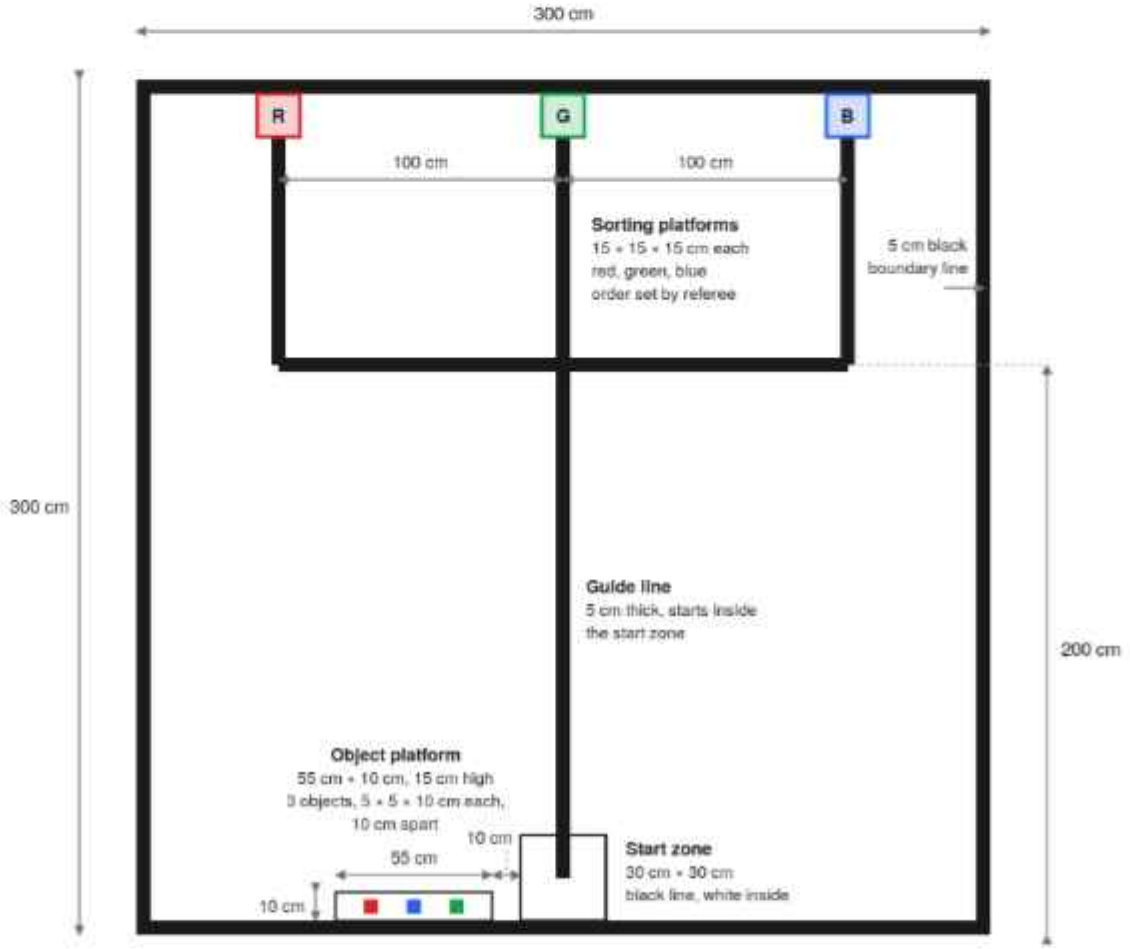
- Track length: **3.7 m**. Total width: **2.9 m**. Smooth white floor.
- The track has **three parallel lanes**, separated by **5 cm black boundary lines**.
- Each track will be 3.7m X 90 cm .
- The lanes are straight, so **three robots can race at the same time**.
- **Starting area:** at the start of each lane there is an area **30 cm wide**, marked with a **1 cm black line**. The robot must stay **inside this area** before the race begins.
- **Finish line:** a **ribbon at a height of 20 cm** is kept at the end point. The robot must **touch the ribbon** to show that it has finished the race.



7.3 Round 3: Autonomous Sorting & Inspection (Object Sorting) Arena

- Size: **3 m × 3 m**, smooth white floor, **not enclosed**, bounded by a **5 cm black line**.
- The **starting zone** of the robot is a **30 cm × 30 cm square** marked with a **1 cm thick black line**, at the center of the arena.
- Three cuboid-shaped objects (**5 cm × 5 cm × 10 cm**) are used: one **red**, one **blue** and one **green**.
- The objects are placed **standing upright** on a **15 cm high platform** at the **left side of the starting zone**. The platform area is **55 cm × 10 cm**, and each object is kept **10 cm away** from the next object. Weight of the object may be upto 20gram.
- There is **no fixed order** of the objects on the platform. The referee places them randomly.

- A **5 cm thick black guide line** starts from inside the starting zone. At its end the line splits into **three 5 cm black branches**, each leading to one colored sorting platform (red, green and blue).
- Each sorting platform is **15 cm × 15 cm × 15 cm** (length × width × height).
- The **order of the colored platforms is random** and decided by the referee before each run.



8. Rules and Scoring of Each Round

8.1 Round 1: Precision Motion & Balance (Dancing Moves) - 15 Points

In simple words: the robot shows its dancing moves and poses on the stage for two minutes.

Industrial relevance: shows stable, controlled and repeatable movement, as needed for robots working beside machines and people.

Task: The robot performs a programmed sequence of movements and poses for **two (2) minutes** inside its own **2 m × 3 m** section, showing as many different steps and stances as possible. Two robots perform at the same time, one in each half of the arena.

Scoring Component	Points	Basis
Performance Ranking	7	Fluidity, creativity and variety of movements, judged by referees
Balance- Biped stance	8	Ability to keep balance in different stances
Balance-Quadruped stance	4	Ability to keep balance in different stances

A robot receives balance points according to its type (biped 8, quadruped 4).

Rules:

- The robot should start from the starting zone.
- If the participants want to stop match during the competition then he/she can stop his robot by raising his/ her hand but other will continue to perform
- Manual correction(like upright robot or restart robot) can be done during competition but negative marking will be done.

Deductions:

- **−1 point** for each manual correction made after the robot falls.
- **−1 point** each time the robot goes outside its own section.

8.2 Round 2: Logistics Transit (Racing) - 25 Points

In simple words: the robot races to the finish line as fast as it can, without any help.

Industrial relevance: shows speed, stable walking and reliable navigation, as in moving materials along a factory aisle.

Task: The robot must travel the **3.7 m track** in the shortest possible time, staying inside its own lane, and must touch the finish ribbon. Robots are ranked by completion time.

A. Rank Points (maximum 16 points)

Rank	Points
1st	16
2nd	14
3rd	13
4th	12
5th onward	Decreases by 1 point for each lower rank

B. Locomotion Points (maximum 9 points)

Robot Type	Points
Biped (two legs)	9
Quadruped (four legs)	5

Total Round 2 score = Rank Points + Locomotion Points (maximum 25).

Rules:

- The robot should start from the starting zone.
- If the participants want to stop match during the competition then he/she can stop his robot by raising his/ her hand but other will continue to perform
- Manual correction(like upright robot or restart robot)can be done during competition but negative marking will be done.

Deductions: -1 point for each manual correction made after the robot falls.

8.3 Round 3: Autonomous Sorting & Inspection (Object Sorting)- 60 Points

In simple words: the robot sorts the red, green and blue objects into the boxes of the matching color.

Industrial relevance: shows machine vision, decision making and accurate handling, as in automated sorting lines and quality control.

Task: Within **10 minutes**, the robot must identify each colored object, carry it along the guide line and drop it into the platform of the **matching color**. The robot may pick up the objects from the object platform by itself, or the team may place them on the robot (see the handling modes below). One robot works in the arena at a time.

Object handling modes

Mode	Description	Points per correct object
Autonomous pick-up	The robot finds and picks up the object by itself, then sorts it	**20**
Human-loaded	The team places the object on the robot, then the robot sorts it	**15**

Scoring rules

Rules:

1. The robot should start from the starting zone.
2. If the participants want to stop a match during the competition then he/she can stop his robot by raising his/ her hand .
3. Manual correction(like upright robot or restart robot) can be done during competition but negative marking will be done -1.
4. Each object correctly sorted into its matching color platform earns points as shown above.
5. Maximum score is **60 points** (3 objects × 20 points).
6. An object dropped into a **wrong platform** gives **−5 points**.
7. The robot must recognize the object color by itself (using a camera or color sensors) and choose the correct branch of the guide line by itself.
8. The referee decides the platform order before the run. Teams may not know the order in advance.
9. The run ends when all objects are sorted or when the 10 minutes finish.

9. Score Summary

Round	Maximum Points
Round 1:Precision Motion & Balance (Dancing Moves)	15
Round 2:Logistics Transit (Racing)	25
Round 3: Autonomous Sorting & Inspection (Object Sorting)	60
Total	**100**

10. Tie-Breaker

If two or more teams have the same total score, the team that completed the **Round 3 sorting task in the shortest time** is ranked higher.

11. Penalties During the Game

11.1 Absence and Delay

1. A team that is not ready after enough notice before its match is considered **absent**.
2. Absences do not count toward scores but are recorded for tie-breaking.
3. The organizers decide how much notice is required.
4. Matches may be postponed only in exceptional and well-justified cases.
5. Teams must arrive with the correct program, charged battery and all required parts.
6. A team with scheduling restrictions on competition day must email the organizers **before the day of the competition**.

12. Sanctions on Competition Day

1. A **disqualified** team cannot play more games, cannot move to the next stage, and loses all awards and mentions.

2. A team that does not register before the **registration closing time** is disqualified. The closing time will be announced the day before the competition. Teams expecting delay must email the organizers in advance. The organizers may make exceptions.
3. If a team member **disrespects** any participant, coach, member of the public or organizer, the incident is reported to the coach. The organizers may take action, including expulsion of the participant or disqualification of the team.
4. If a team **damages the venue or the materials of other teams**, the same process as in point 3 is followed.
5. A team that is **repeatedly sanctioned** may be called to a meeting with the organizers. If the team shows disregard for the rules, it may be disqualified or some members expelled.

13. Safety Rules

1. All robots must pass a basic safety check before every round.
2. Teams must be able to switch off their robot immediately on the referee's request.
3. Only team members approved by the referee may enter the arena.
4. Teams are responsible for safe battery handling and charging at the venue.

14. Technical Document Submission

Each team must submit a technical document before the competition. It must include:

1. Team name, members and institution (if any).
2. Robot design and mechanical structure (drawings or photos).
3. Fabrication process and materials used.
4. Electronics, sensors, actuators and power systems.
5. Software, control algorithm and image-processing method.
6. Working principle for each of the three rounds.
7. Industrial application idea: how the robot's technology can be used in a real industry.

15. Judging and Rule Changes

1. The decisions of the referees and the organizing committee are **final**.
2. The organizers may update or clarify these rules before the competition. All teams will be informed officially.
3. Any rule not covered here will be decided by the organizing committee.

16. Registration fee (per team)

Category	Fee(NPR)	Window
Normal	NPR 4500	Opening of registration
Late	NPR 6000	registration closes

How to register

1. Fill in the online registration form at yantra.ran.org.np with team details.
2. Pay the fee and upload the payment receipt(For Nepali Participants).

17. Awards & Certificate Policy

17.1 Awards

Award	Cash prize	Additional benefits
Winner	NPR 60,000	Participation Certificate, Winner Certificate and feature in Yantra Media
Runner-up	NPR 35,000	Participation Certificate, Winner Certificate and feature in Yantra Media
Other Participants	To be announced	Winner Certificate and feature in Yantra Media

17.2 Certificate policy

1. Certificates of Excellence or Achievement go to all award winners.
2. Certificates of Participation go to all participating teams.
3. Teams disqualified for breaking the rules are not eligible for any certificate.

Note: Prizes are subject to applicable government taxes

18. Contact Details

Lead, Yantra Autonomous Intelligence Industries : Subash Shrestha, 9860514177, Robotics Association of Nepal

Lead, Yantra: Kiran Khatri, 9766387092, Robotics Association of Nepal

Milan Tamang, Vice-President, Robotics Association of Nepal Managing Director, Yantra X: Intelligence & Entrepreneurship Festival: 9860059600

General inquiries : yantraxirc@gmail.com | www.ran.org.np

**** Some of the rules and regulations, and minor gameplay are subject to change as required in future ****

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