



DELHI ROBOTICS LEAGUE 2023

ROBO KANCHA

RULE BOOK



Dr. B.R. Ambedkar School of Specialised Excellence
Directorate of Education,
Government of NCT of Delhi



IHFC

I-Hub Foundation for Cobotics
Technology Innovation Hub of IIT Delhi
Knowledge Partner of DRL

[HTTPS://DELHIROBOTICSLEAGU.WIXSITE.COM/DELHI-ROBOTICS-LEAGU](https://delhiroboticsleagu.wixsite.com/delhi-robotics-league)

Contents

1	Delhi Robotics League	1
1.1	Background of Traditional Kancha Game	1
1.2	Importance of Safety	1
2	Outline of the Robo Kancha game for DRL 2023	2
3	Game Field	3
4	Rules of the Game	5
4.1	Terms and Definitions	5
4.2	Game Procedure	5
4.3	Robot Specification	6
4.4	Violations	7
4.5	Disqualifications	7
4.6	Safety	7
4.7	Teams	8

1 Delhi Robotics League

Delhi Robotics League (DRL) is conceived to bring skills and competencies to the school students of Delhi State. It is aimed to enable the students to learn problem solving: by conceptualizing the game solutions, designing and building robots, testing and debugging, and finally making a winning strategy. It also inculcates attributes of communication, team-spirit while working as a group and industry readiness which is the norm of the society.

CONTEST OUTLINE

Title: Delhi Robotics League

Organizer: Dr. B.R. Ambedkar School of Specialised Excellence

**Knowledge Partner: I-Hub Foundation for Cobotics (IHFC),
Technology Innovation Hub of IIT Delhi**

Contest Date: July 6-7, 2023

Venue: Thyagraj Stadium, New Delhi, India

Schedule: Registration starts December 12, 2022,

For more details visit <https://delhiroboticsleagu.wixsite.com/delhi-robotics-league>

Theme and Rules: ROBO KANCHA

Competition Method: Preliminary and Final Game

Participants: Class IX and X School Student Teams from Delhi Schools

Awards: DRL Award, 1st Runner-Up, 2nd Runner Up, Best Idea Award, Best Design Award, Special Awards

1.1 Background of Traditional Kancha Game

Kancha is a traditional game mostly played by children but cherished by people of all ages. The primary objective of the game is to hit the target balls with one's marble (Kancha) in a particular manner from a distance. Successfully hitting the target of the opponents' results in that person taking the marbles. This game is also famously known as "goti". The pride of owning a variety of beautiful-looking marbles is one of the hallmarks of this game. It can be played among many players but a minimum of two (2) are required. A rough circle is drawn and both players keep their marbles at the center. Now, each player tries to hit as many marbles as they can from a distance.

1.2 Importance of Safety

Safety is one of the essential elements of the Delhi Robotics League. The participating teams, as the robot designers, are responsible for the safety of their robots. Safety must always be the top priority and must be considered by all people involved in the contest, including officials, participants and spectators in all circumstances. Safety in the performance of robots must be visible both to the naked eye and the cameras. One should easily observe whether the designed robots meet the safety requirements during the video check and test runs. Please attach the



Figure 1: Kancha, a traditional game

actual emergency button on the robots. Team members must take care of their safety apart from the robot's safety by wearing helmets while on the play field.

2 Outline of the Robo Kancha game for DRL 2023

- A) More than one team can participate from a school.
- B) Each team must build/assemble their own robot.
- C) There are TWO rounds (Round 1 and Round 2) per game.
- D) Each team's robot should work in two Roles: Blocker mode and Shooter mode.
- E) In round 1 of each game, first team A plays in blocker mode then team B plays in shooter mode.
- F) Team A playing in blocker mode will block the pot holes with discs. The time given to do this task is ONE minute.
- G) After above task, the team B playing in the shooter mode will displace the pot balls placed in the blue circle by using shot balls. The robot should be in the Shooter Start Zone (SSZ) while the shot balls are thrown/pushed.
- H) After above task, the robot now can move to Kancha Area and push the pot balls into the pot holes.
- I) Pushing of displaced Pot Balls from one circular ring or from the Game Field to another circular ring is not allowed.
- J) The total time given for the shooter mode is THREE minutes.
- K) The roles of the teams will reverse in the next round.

- L) Points will be calculated according to the pot balls placed at different location on Kancha Area (based on circular ring colour) and Game Field, bonus points for the potholes filled by discs and pot balls. Refer to Table 4 for Points.
- M) The winner will be announced on the basis of highest score. Refer section 4.2 (3) for details.

Table 1: Roles of Robot

	Team A (Red)	Team B (Blue)
Round 1	Blocker	Shooter
Round 2	Shooter	Blocker

3 Game Field

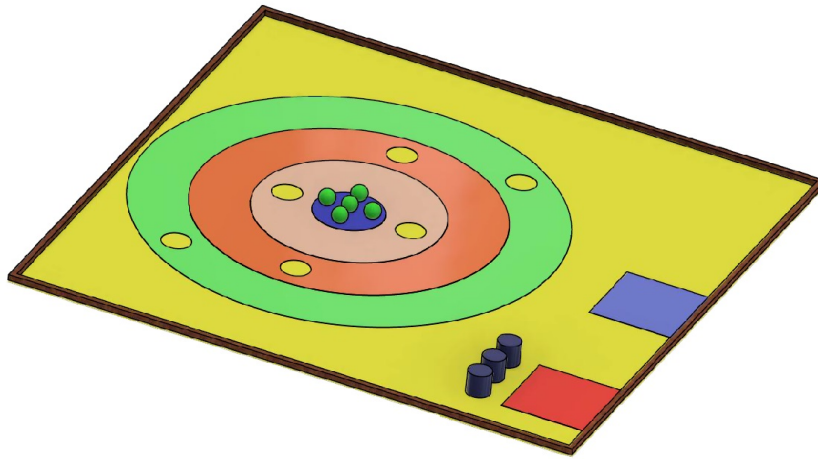


Figure 2: Perspective View of the Game Field

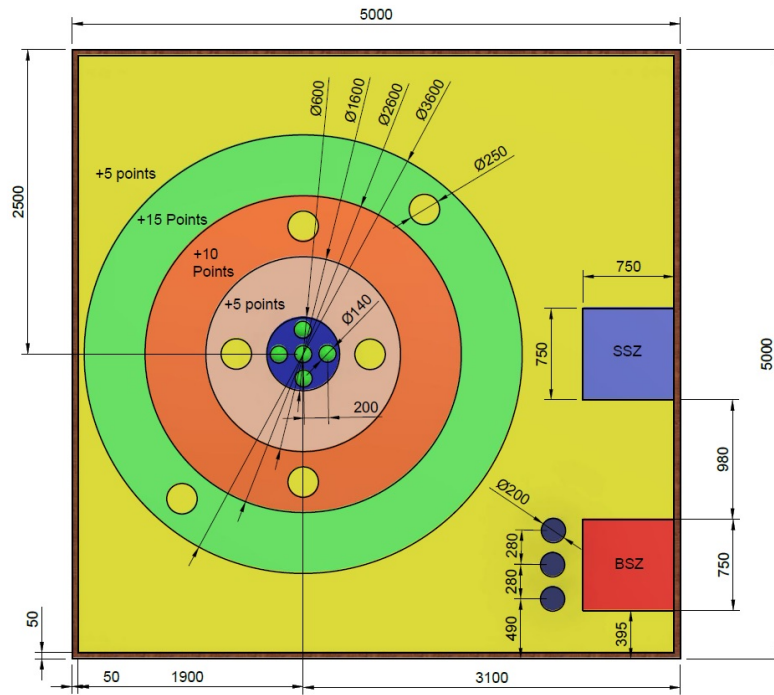


Figure 3: Top View of the Game Field with labeling and dimensions

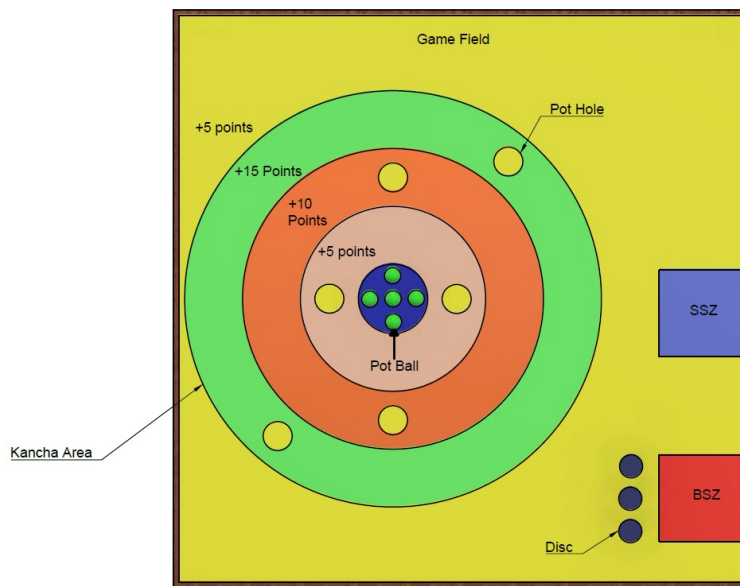


Figure 4: Top View of the Game Field

4 Rules of the Game

4.1 Terms and Definitions

The terms relevant to this game, and their definitions are given respectively in Table 2 and Table 3.

4.2 Game Procedure

The total time per each game is NINE minutes. Each Round will take for FOUR minutes and Setting time will be ONE minute before the start of each round.

1. Detailed steps of the game

1.1 Before the game

- Both teams place their robots in their respective start zones in the field.
- Referee will signal for setting time before each Round starts.
- All the three shot balls must be pre-loaded on the robot for the Shooter mode.

Once setting is done, the team can start their respective robots on Referee's signal.

1.2 During the game

- The game will start with Round 1.
- All team members should stay outside of the game field except when they need to retry and push the start button of the robot.
- Team members should not touch the discs or balls.
- When Round 1 starts, Team A's Blocker will push the discs and try to block the potholes in the Kancha Area. There will be THREE discs that can be used to block any three pot holes within the Blocking Time.
- Blocker Robot should not touch the pot balls. If it touches, the blocker mode will be immediately stopped.
- Team B's Shooter will now shoot the pre-loaded shot balls at the pot balls placed on the blue circle of the Kancha Area. During this, the robot should not move out of the designated SSZ. There will be THREE shot balls to be played.
- If the robot comes out from the SSZ, the referee may ask the team for retry.
- After shooting the shot balls, Team B's robot will then start moving to the Kancha area to push the pot balls that have not entered any potholes and try to get them into the available pot holes present in the same circular rings.
- The above shooter tasks should be completed within the Shooting Time.
- The roles of Team will reverse for the next round.

2. Scores

Refer to Table 4 & Table 5

3. Deciding the Winner

The team with the highest total score wins. If there is a tie, the winner will be decided in the following order:

- Team that completes the whole task (Blocking and Shooting) in the least time.
- Teams that score maximum in the Shooter mode.

- Teams that block the maximum pot holes using the disc in blocker modes.
- Final decision taken by Judge

4. Retry

- If needed the team can apply for a retry within the first 15 secs of any mode. Retrying can only be done with the permission of the referee.
- If the robot violates the rules, the robot will be forced to retry according to the referee's instructions.
- When retrying, the robots should return to their respective start zones and restart.
- There is no retry if the pot ball goes outside the Game field
- There is no retry in blocker/Shooter mode if the game time ends

4.3 Robot Specification

- Each robot cannot be split into sub-units or connected by flexible cords during the game. The robots are not allowed to use suction or to stick on the game field.
- The robots in the contest must be built by team members from the same school.
- Teams are not allowed to bring or set up any equipment around the field, except robots and spare parts used in the game and some tools/devices used in resetting time.
- Robot Size
 - At the game beginning, each robot must not be more than 500 mm in length and 500 mm in width.
 - When cables are used to control a robot, the length of the cable is unlimited. However, the teams should be careful to avoid cable winding with the field facilities and game objects. Both for wireless or cable operation, the team members are not allowed to enter the game field.
- Weight of Robots
 - The total weight of robots, controllers, the primary set of batteries used in the game must not exceed 30 Kg
 - Any other equipment that the team brings for setup purposes, tools, air containers, and backup batteries (of the same type as that initially installed in the robot) are exempt.
- Power Source of Robots
 - Each team shall prepare its own power source.
 - Teams can use only batteries, compressed air, and/or elastic force as power source.
 - The nominal voltage of any battery used in the robot, controller, and any other devices during the game shall not exceed 24V. However, when connecting batteries in series, the total voltage must be 24V or less.
 - Measured voltage should be set to 42V or less by actual measurement. If the power supply system includes multiple isolated circuits, voltage in each system must be 42V or less.

- Teams using compressed air must use either a container made for the purpose or a plastic bottle in pristine condition prepared appropriately. Air pressure must not exceed 600 kPa.
- Any power source deemed dangerous may be banned from use.
- During the test run before the contest, referees, will inspect the robots. Robots that do not meet the above requirements will not be allowed to participate in the game.

4.4 Violations

- The robot must not touch the pot balls placed in the blue circle. If the Blocker/ Shooter touches the pot balls placed in blue circle, the blocker mode/Shooter mode for that round will be immediately stopped.
- In the Shooter mode if the robot moves the Pot Balls from one circular ring to other, the shooter mode for that round will be immediately stopped.
- The dispersed pot balls on the Game Field also cannot be moved into the Kancha Area.

4.5 Disqualifications

A team will be disqualified if it takes any of the following actions during the game:

- The design and build of the robot are not following the rulebook.
- The team intentionally damages or tries to damage the field, facilities, game objects.
- The team performs any acts that are not in the spirit of fair play.
- The team fails to obey instructions or warnings issued by referees.

4.6 Safety

The design and build of robots should not pose any kind of danger to any person at the competition scene. All robots must be designed and built to cause no damage to any robots of the opposing team or the field. Give below are some safety measures to be followed:

- Attach an actual emergency stop button on the robot. A real visible emergency stop button is to be connected to each of the robots to enable one to shut down the robot in case of loss of control at any time.
- Team members must wear running shoes, helmets, and safety goggles during the games and test runs.
- The use of explosives, fire, or dangerous chemicals is prohibited.
- Accumulators, lead-acid batteries are not allowed.
- In designing and using the laser or infrared beams, full care must be taken to protect all persons at the venue from harm during all procedures. In particular, the beams must be so oriented that they cannot shine into the spectators' eyes.
- If the laser is used, it must be of class 2 or less.

- When using radio for signal transmission, teams must design systems, circuits, and mechanisms and ensure they do not go out of control and/or move dangerously even if a short circuit occurs or a connection is broken.
- When teams have multiple power supply systems, teams must design the circuits and mechanisms not to go out of control or move dangerously no matter which power supply is lost or regardless of the order of turning on the power.
- To avoid starting a fire or smoking by the overload of a motor stall and so on, proper current limiting devices such as a circuit breaker must be installed to power supply circuits.
- Use wires, connectors, terminals, etc., with a rated current equal to or higher than the assumed maximum current.

4.7 Teams

- Each school from Delhi may have as many teams it likes.
- Each team consists maximum of five (5) students (called team members), and one (1) instructor. They all belong to the same school.
- In addition to five (5) team members, an additional five (5) student members are allowed to register as the pit crews and to assist in the pit area, to carry the robots to the field, and participate in the setting of the robots. They must be students of the same school as a team.

Table 2: Terms and Definitions

S. No.	Term	Definition
1	Team	There will be two teams named Team A (Red) and Team B (Blue)
2	Robot	Each team must build ONE Robot, that can work in two roles. They are shooter and blocker modes. The dimension of the robot: Width: Less than or equal to 500 mm. Length: Less than or equal to 500 mm. Height: No restriction.
3	Shooter Mode	In the shooter mode, the robot will shoot the shot balls placed at the blue circle in the Kancha area, aiming to score points. The robot can move to the Kancha area to fill the displaced pot balls into the pot holes but it cannot enter or touch physically the pot balls remaining/leftover in blue circle.
4	Blocker Mode	In the blocker mode, the robot will push and place discs over the pot holes, one at a time. There will be three discs available for blocking the pot holes near Blocker Start Zone. The robot can move to the Kancha area to fill the pot holes but it cannot enter or touch physically the pot balls in blue circle.
5	Disc	It is a cylindrical disc of dimensions 200mm (height) \times 200mm (diameter). The material used is POLYURETHANE Foam of density 14 kg per cubic meter. Note that “top” and “bottom” surfaces of each disc are uncollated.
6	Pot Ball (Green Balls)	The balls placed in the center of the Kancha area, that need to be dispersed to score points. There will be 5 pot balls in the game. The diameter of each Pot ball is 140mm, weight with air 205 Grams, air pressure 1.25 to 1.50 Bar.
7	Shot Ball (Orange balls)	The ball that the robot shoots aiming to hit the pot balls. There will be 3 shot balls. They should be preloaded on the robot all at a time before the round starts. The diameter of each Shot ball is 140mm.
8	Kancha Area	Kancha Area is composed of 3 circular rings of various colors and a blue circle in the center (Refer to Figure 4). The center circle is having a diameter of 600 mm. The outer diameter is of 3600mm.
9	Green Circular ring	The outermost circular ring, colored Green. The shooting team will receive 15 points for each pot ball that lands here after the robot shoots.
10	Orange Circular ring	The orange-colored circular ring immediately inside the Green circular ring. The shooting team will receive 10 points for each pot ball that lands here after the robot shoots.

Table 3: Terms and Definitions

S. No.	Term	Definition
11	Pink Circular ring	The pink circular ring immediately inside the orange circular ring. The shooting team will receive 5 points for each pot ball that lands here after the robot shoots.
12	Blue Circle	In this blue circle 5 pot balls are placed at the beginning of the game.
13	Game field	The game field is the area where the robot must complete its tasks. It is a square area sized 5000 mm X 5000 mm. If the ball lands in the Game Field excluding the Kancha Area, the shooting team gets 5 points.
14	Pot Hole	Pot Holes are placed in certain locations in the orange, green and pink circular rings. In blocker mode, the robot must aim to cover these holes with the disc. For every disc that covers the pot hole, bonus 5 points is scored. In shooter mode, the robot must aim to fill the pot holes with the pot balls. For every pot ball that falls in a pot hole, bonus 5 points is scored.
15	Blocker Start Zone (BSZ)	The position from where the blocker robot pushes the disc to block the pot holes. The dimension of BSZ is 750 mm X 750 mm.
16	Shooter Start Zone (SSZ)	The position from where the shooter robot shoots the shot balls to displace the pot balls. The dimension of SSZ is 750 mm X 750 mm.
17	Round 1 and Round 2	Each game will have two rounds. In Round 1, Team A plays blocker mode and Team B plays shooter mode. In Round 2, Team B plays blocker mode and Team A plays shooter mode. Duration of each round is FOUR minutes. This includes blocking time and shooting time.
18	Blocking Time	The duration of Blocker mode is ONE minute only.
20	Shooting Time	The duration of Shooter mode is THREE minutes only.
21	Setting Time	Referee will give the ONE-minute setting time before each Round starts.
22	Referee	The person who manages the game considering all rules and regulations.
23	Judge	The person who awards the points and declares the winner for each game.

Table 4: Points Table

S. No.	Based on Balls and Disc Position	Points
i	Balls within Green Circular ring	15
ii	Balls within Orange Circular ring	10
iii	Balls within Pink Circular ring	5
iv	Balls outside Kancha Area but on Game field	5
v	Balls on the boundary of any circular ring in Kancha Area	Points to be given on basis of inner Circular ring
vi	Balls on the boundary of Kancha Area and Game field	5
vii	Balls placed outside the Game Field	No points
		Bonus Points
i	Balls in Pot Holes	5
ii	Disc in Pot Holes	5

Table 5: Demo Scores

Scenario. 1	Points
i) All 5 Pot Balls in the Green Circular rings	$15 \times 5 = 75$
ii) Balls within Orange Circular ring	$5 \times 2 = 10$
iii) 3 Discs on the Pot Hole	$5 \times 3 = 15$
Scenario.1 Total	100
Scenario. 2	Points
i) 4 Pot balls in the Green Circular ring and One ball in Orange Circular ring	$15 \times 4 + 10 = 70$
ii) 1 out of 4 Pot Ball in the Pot Hole of Green circular ring and 1 out of 1 ball in the Pot hole of Orange Circular ring	$5 \times 2 = 10$
Scenario. 2 Total	80
Scenario. 3	Points
i) 2 Balls in the Orange Circular ring and 2 Balls the in Green Circular rings	$15 \times 2 + 10 \times 2 = 50$
ii) 1 Ball on the boundary of Green Circular ring with Game field	5
iii) 1 out of 2 Balls on the Pot Hole Orange Circular ring	5
Scenario. 3 Total	60