RUHUNA

Robotic Challenge

2019

Undergraduate Category

2019

UNDERGRADUATE CATEGORY

1. TASK PROCEDURE

- There are two rounds in the contest.
- The robots should compete on the **same platform** in the two rounds, but there are some **modifications** of the platform in the second round.
- The top **10** teams of the first round will be qualified for the second round and the winner of the competition will be selected from the second round.

FIRST ROUND

- Platform specification and component specification are given under **section 2.**
- Overview of arena is shown in **Figure 02.**
- The robot must start from the starting square. The details of this square are given in the **Figure 05**.
- It should navigate towards the **area A**, which consists of a cube with a single colour as shown in the **Figure 07**. The colours can either be **red, blue** or **green**.
- After arriving at the **area A**, the robot must detect the colour of the cube placed and should then move to the **area B**.
- In the **area B**, there is another cube with multiple colours on four sides of its surface excluding the top and the bottom as shown in the **Figure 08**.
- Here, the robot should be able to detect the number of sides in the cube having the colour that was previously detected in the **area A**. This number would be 1, 2 or 3. robot allow to rotate the cube if it necessary.
- After that, it should move to the **area C** and by some means, it should clearly indicate the detected colour and the number of sides that was detected in the **area B**. the indication method should be describe to the judge panel before start the game.
- The robot should then move to the **area D** with solid and dashed lines as shown in the **Figure 04** and it should reach the **push button E**.

- After pressing the push button by the robot, the **gate F** opens and it is then allowed to enter to the **line maze H**. sample of line maze is shown in **Figure 02**.

- If robot unable to open the gate team members can request to the organizing committee member to open the gate manually.

- **Area G** (Ramp and two cross lines) is not appeared in first round.

- The background of the line maze is black and navigation lines are white. Line maze is containing only the straight lines. The distance between two parallel line would be 25 ± 0.2 cm. The distance between maze boundary and parallel line also 25 ± 0.2 cm as mention in **Figure 02**. There is **no loop path** inside the line maze.

- Robot should then move through the line maze and reach to the **area I**.

- The robot is then need to guide itself to the **room 1** as shown in arena, **Figure 02**. A non-metallic sword is placed at the **room 1** in **area I** and weight of the sword would be 10 ± 5 grams. This sword is further illustrated in the **Figure 12**. The sword place inside the hole (diameter of 1.2 ± 0.2 cm) of sword base and sword can be move upward softly.

- The sword should be picked by the robot and it should move to the **area J**, by following the shortest path in the **maze H**.

- Finally, the robot should place the sword in the base corresponding to the count that was shown in **area C**. This sword base's specification is given in the **Figure 13**.

SECOND ROUND

The second round is similar to the first round with some modifications.

- After the robot opens the **gate F**, it should reach to **area G** and cross the ramp, which is shown in the **Figure 10**.

- Line maze will be changed.

- A sword will be available in each of the three rooms of the **area I**. The robot should find the metal sword out of them. The metal sword has electrical and magnetic properties. weight of the metal sword would be 20 ± 5 grams.

2. PLATFORM SPECIFICATIONS

** All the measurement can be varies ± 0.2 cm.

THE ARENA

The basic shape of the arena is rectangular with the dimensions as follows.

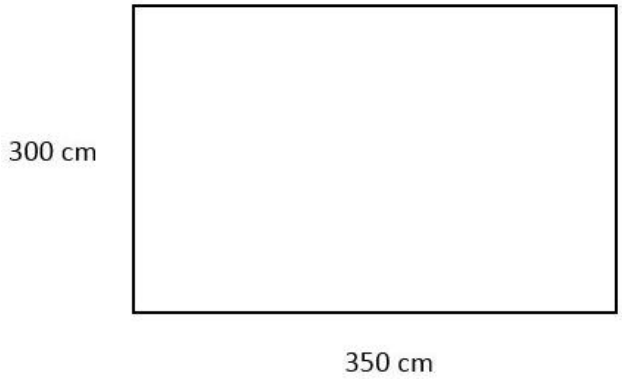

Figure 01: Dimensions of the Arena

The overview of the arena is shown in the figure 2 with its main regions marked with uppercase letters.

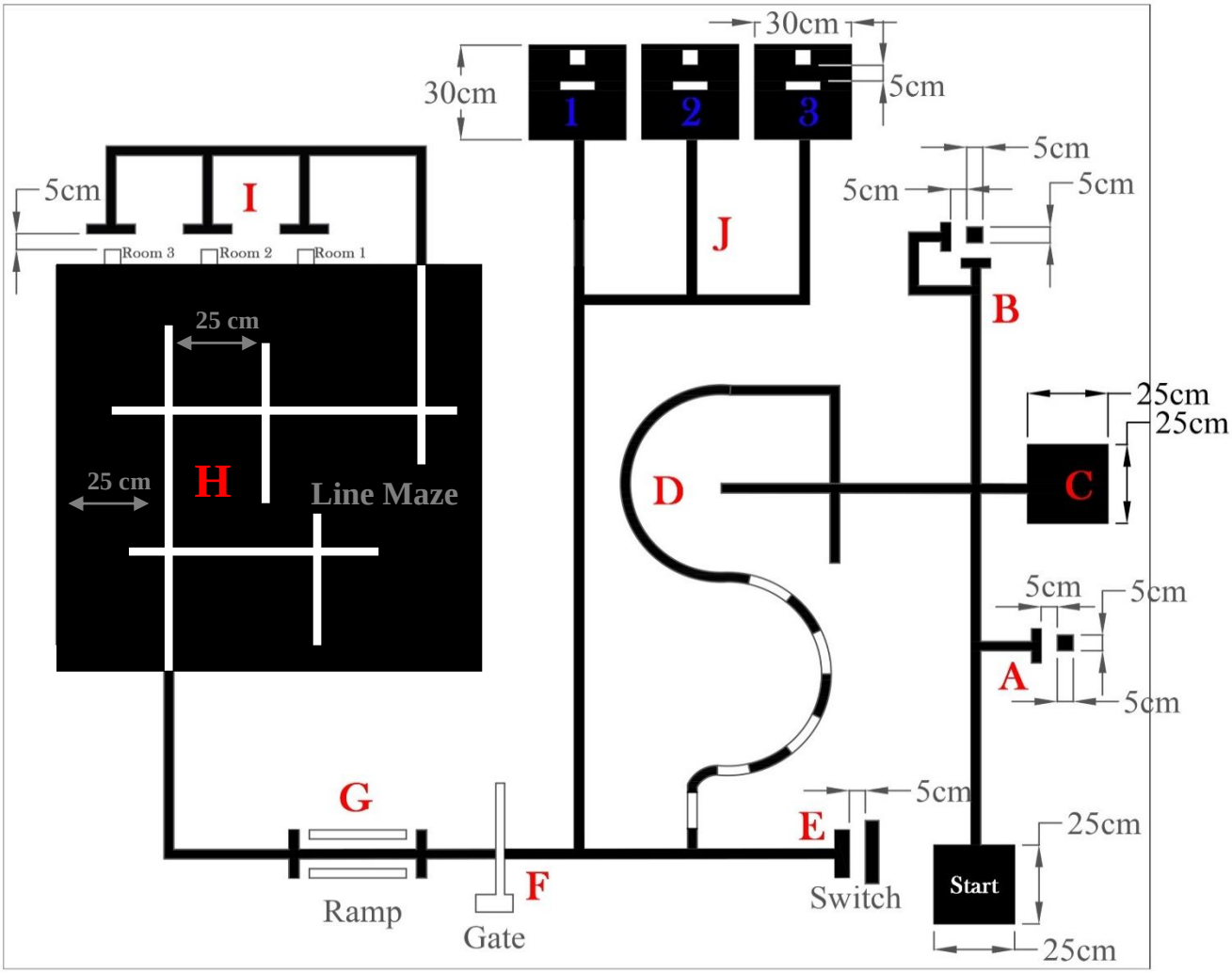

Figure 02: Overview of the Arena

COMPONENT SPECIFICATIONS

The following images show the details of the various compartments in the arena.

LINE

All black and white navigation lines have line width of 3.0 cm

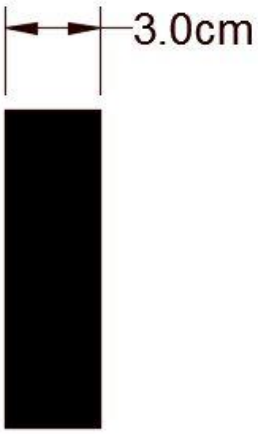

Figure 03: Line Width

DASHED LINE

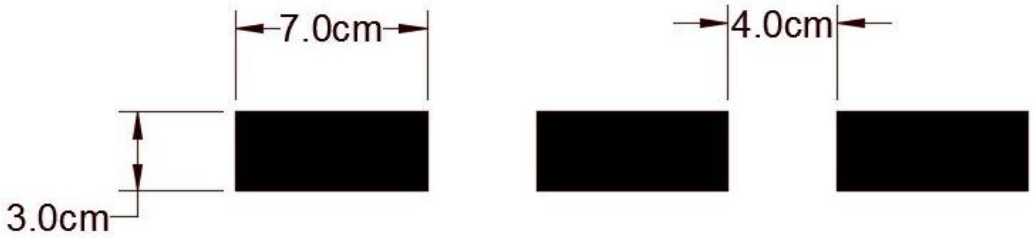

Figure 04: Dashed Lines Specifications

STARTING SQUARE

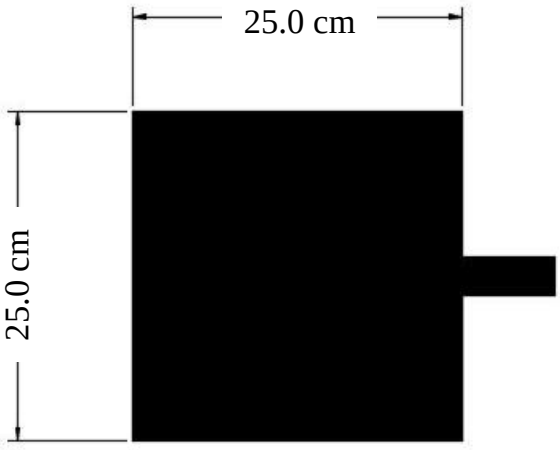

Figure 05: Starting Square Dimensions

STOP POINT

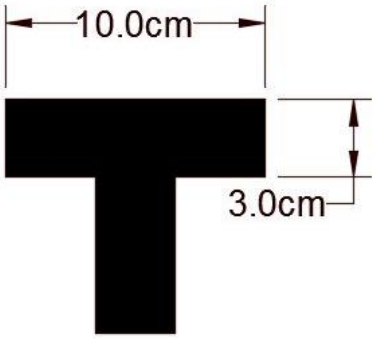

Figure 06: Stop Point Details

CUBE

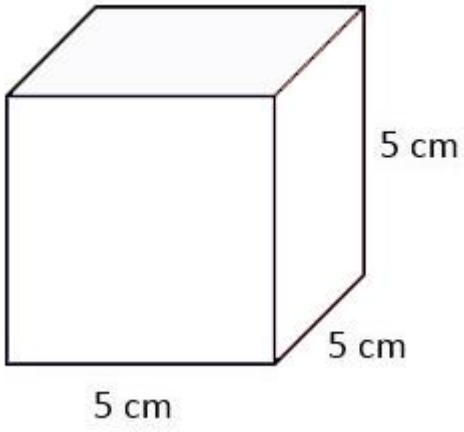

Figure 07: Basic Cube Dimensions

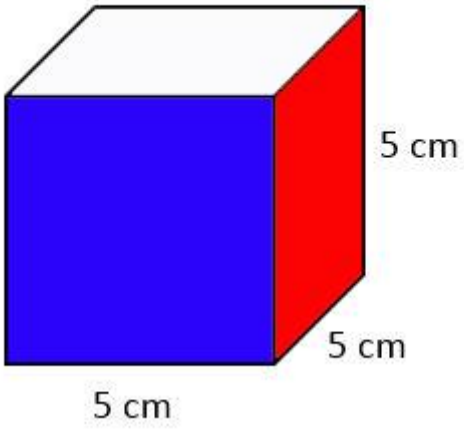

Figure 08: Cube with Different Colours on the Lateral Surface

SWITCH

The push button in the switch is indicated by the circle which is 5.0 cm above the platform's surface. Push button is extruded from support surface and support surface is vertical orientation. The touching area of the push button would be 1 cm^2.

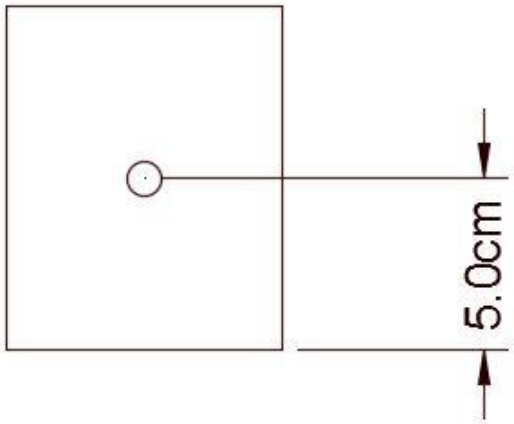

Figure 09: Switch with the Push Button

RAMP

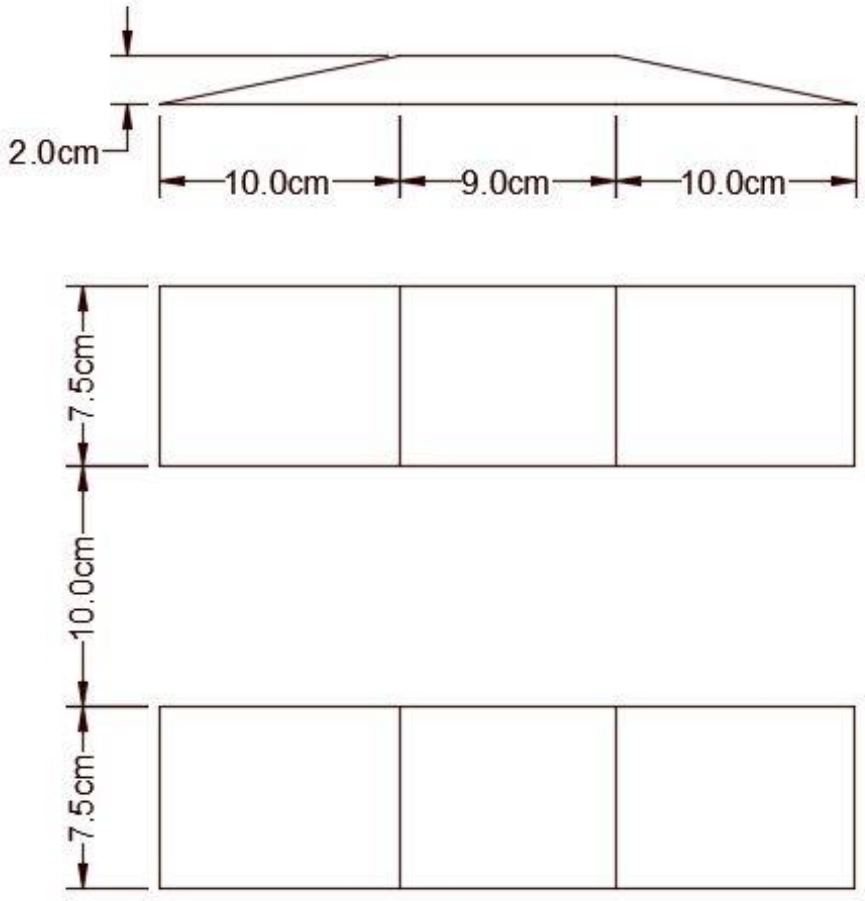

Figure 10: Lateral and Top View of the Ramp

GATE

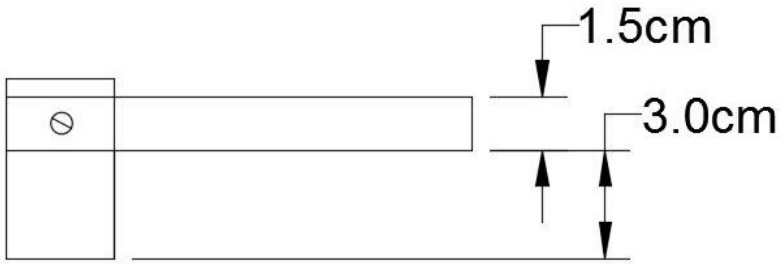

Figure 11: Details of the Gate

SWORD

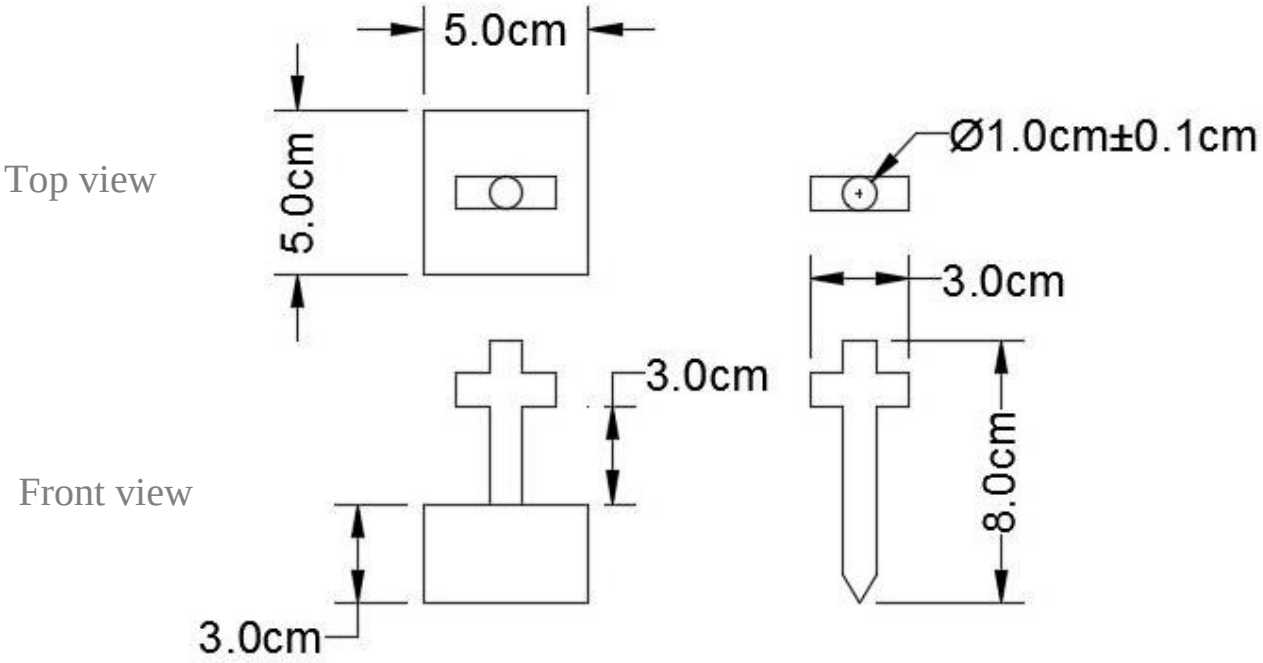

Figure 12: Sword Specifications

SWORD BASE

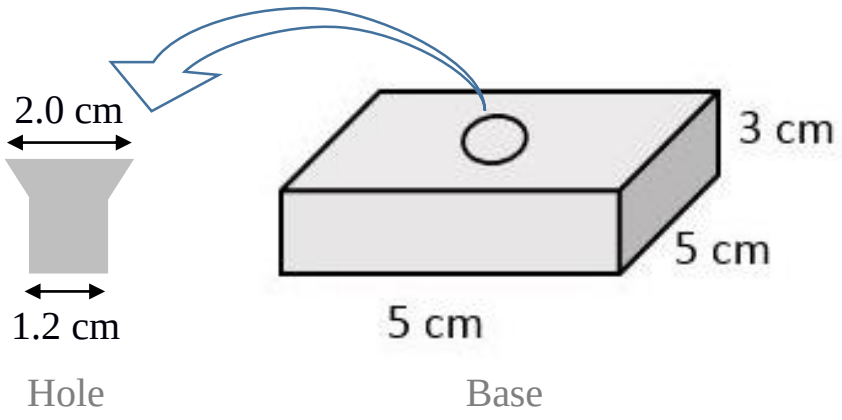

Figure 13: Sword Base Dimensions (For **Area J**)

3. ROBOT SPECIFICATIONS

3.1. The dimensions of the robot should not exceed 25 cm x 25 cm (width x length). The robot to be placed on the starting square should be fitted inside a box with dimensions of 25 cm x 25 cm. The robots which do not address these requirements would lead to disqualification.

3.2. The robot should be **completely autonomous** without any sort of remote controlling.

3.3. The task should be completed by only one autonomous robot and **secondary robots are not allowed**.

3.4. The robot should be supplied with an internal power source. External power supplies are not allowed.

3.5. Voltage difference between any two points on the robot must not exceed 24 volts and the final unit including the power source should be within dimensions in specification 3.1 above.

3.6. The robot must be completely built by the team themselves. No off-the-shelf kits are allowed except the processing boards, sensor modules and drive gears.

3.7. The robot should not cause any damage to the gaming platform. Any kind of damage to the gaming platform would lead to **disqualification**.

3.8. A single start/stop switch should be available on the robot for activating the robot at the start and the robot should be stopped using the stop switch.

3.9. The starting procedure of the robot should be simple and should not involve giving the robot any manual force or impulse in any direction.

3.10. Since the whole arena can't be constructed on a single board, there can be slight differences in height at the boundaries of the 8'x4' boards.

3.11. Minimum distance between the middle of the lines and the edges of the arena will be 20 cm. The robot should be designed in a way that it won't fall out of the arena.

3.12. There should be an indication method to indicate detected colour and also the number of coloured sides count of the cube described in the **section 1**. RGB LED indication, LCD display or any other clear indication method which can be observed by the judge panel are accepted

4. GAME RULES

4.1. Team leader is allowed to choose the coloured cube by randomly select token before the first attempt.

4.2. The robot should satisfy the specifications under the **section 3**.

4.3. All the robots are collected 15 minutes before the competition.

4.4. When a team is called to compete for the task, they must report within five minutes.

4.5. Before start the first attempt 2 minutes is given for calibration of the robot.

4.6. Maximum time of 15 minutes is allocated for a team (for all three attempts except 2 minutes calibration time). Modification for the program or the hardware of the robot is **allowed only between interval of first round and second round**. Three maximum number of attempts are given for a team. The best attempt is considered for grading. All the attempts are reserved for this time period only. If the robot exceeds the time limit of 15 minutes, your robot will be removed from the arena.

4.7. If they fail to finish calibrating within this 2 minutes, the extra time taken will be deducted from the time allocated for the three attempts.

4.8. After commencement of an attempt, any interaction between the robot and the team members would be prohibited. Interaction with the robot is considered as the termination of the attempt.

4.9. Each new attempt should start from the starting square and the moving direction of the robot can be decided by the team.

4.10. During any parts of the task, if a robot deviates from a line and fails to return within 20 seconds, human intervention would be allowed, and the next trial has to be taken as a new attempt. You can also take a new attempt before the 20 seconds with the permission of the judges.

4.11. Time is measured from the starting referee signal to the point of stopping the attempt.

4.12. The team can decide to stop the robot anytime and be credited with the distance traveled along the line and the time consumed until the robot stops.

4.13. If there is a tie between the robots, a run-off will determine the winner.

4.14. There will be a technical inspection before every round.

4.15. A sample arena will be given for tuning purposes.

4.16. Participating teams are responsible for the safety of their robots.

4.17. The organization and the organizing team members are not held responsible or liable for any incidents and/or damages to the robots caused by the participating teams and/or testing and/or competing the task.

4.18. The team leader may forward their objectives or doubts on the task and the game rules to the organizing committee. Then the organizing committee will attend to these objections and doubts with the help of the judge panel.

4.19. The decisions taken by the judges will be the **final** decision. No objections shall be declared against the judges' decisions.

4.20. Penalties are given for following robot behaviors in the steps described in **section 1**.

- Not including any indication method for the count and cube colours.
- The gate is open manually by organizing team.
- The robot does not go through the ram in properly.
- The robot fails to solve the optimum path of the maze.
- Robot does not consistently move in the navigation paths.

5. TEAM REQUIREMENTS

A team may consist of maximum 5 members from the **same** educational institute.

6. ELIGIBILITY

All students possessing a valid identity card, issued by the respective educational institute are eligible to participate in the event. All the members of the team should not exceed 28 years of age.

**Any changes will be informed to the team leaders via e-mail.