ROBOTEK '20

Theme

Modular University Category

Organized by:

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Department of Computer Science
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Introduction

ROBOTEK is an annual robotics competition organized by Garrison Engineering and Robotics Society (GEARS) supported by Department of Computer Science and Lahore Garrison University (LGU) to groom, empower budding students to make them self-sufficient in the field of robotics and automation by giving them real-time hands-on exposure to build robots. Garrison Engineering And Robotics Society (GEARS) welcomes you all to participate in 4th robotics competition (ROBOTEK '20).

The main objective of Garrison Engineering and Robotics Society (GEARS) is to make the aspiring engineers acquainted with the conceptual as well as practical knowledge of the upcoming Robotics technology by organizing workshops and competitions. The idea of organizing these workshops and competition is to inculcate the basic fundamentals of Robotics in the students and provide them with a platform to work on, in the near future.

Robotics involves the concept of electronics, mechanics, and software. A Robot is a virtual or mechanical artificial agent. In practice, it is usually an electro-mechanical machine which is guided by computer or electronic programming, and is thus able to do tasks on its own. The guiding force behind the robot will be an Embedded System. At the core of every Embedded System there is either a microprocessor or a microcontroller or any other programmable intelligent unit. In this ongoing cutthroat competition, it is mandatory for every group of students to possess the assigned task. In this competition the students will become equipped with enough knowledge to start with the designing and development of their own projects and implement their raw ideas into reality.

1. Categories

1.1   Background

Garrison Engineering and Robotics Society was founded in 2016 and primary focus was to build students interest in field of Robotics and for that purpose LEGO kits were utilized. In ROBOTEK '17 only single category (Modular University) was offered for students of Lahore Garrison University students only. ROBOTEK '17 played a vital role in building students' interest, idea went diverse and supervisor of the GEARS motivated and encouraged the interested students to work on indigenous robots. In ROBOTEK '18, Garrison Engineering and Robotics Society added Modular Schools category along with Modular University Category to promote Robotics at root level. ROBOTEK '19 was organized at bigger scale than all its previous versions. ROBOTEK '19 invited teams from all over Pakistan and offered three categories which were Indigenous Category, Modular University Category and Modular Schools Category.

1.2   ROBOTEK '20

This year Garrison Engineering and Robotics Society (GEARS) has intended to make ROBOTEK bigger and better which features bigger cash prizes and added new category of ROBO SUMO. This year ROBOTEK '20 will be featuring four categories which are:

a.   Modular Schools Category
b.   Modular University Category
c.   Indigenous Category
d.   Robo-Sumo Category

Universities, Schools and Colleges from whole country are invited to attend the event.

1.2.1 Modular Category

The modular robots are built by assembling the LEGO kits. These kits include sensors, large & medium motors and a brick (brain of LEGO kit). Once assembling is done, it can be coded using provided graphical pallets or using MATLAB or some other programming language.

1.2.2 Indigenous Category

Indigenous Category includes robots which are made from scratch. Their mechanical design, Electrical circuits are the product of team's own abilities. These electro-mechanical machines are then programmed to complete tasks own their own.

1.2.3 Robo Sumo Category

To participate in the "Robo Sumo" Category, participants need to prepare an autonomous robot that is capable of pushing the enemy robot out of the circle.

2. Structure of the Competition

Competition will follow the structure given below for Modular University Category:

  i.   Heats Round
  ii.   Head to Head Matches

2.1 Heats Round

Heats Round will give a chance to every team to run their robots in a stipulated time. Teams having some points on the table will straightaway qualify for head to head matches where they'll play head to head matches with the other participating teams. Each team will be given **3 minutes** to run their robots.

  i.   Each team will be permitted 1 minute before the match to check their robot (None of the teams can run their robot on the main arena before match).
  ii.   After heats round, matches schedule will be displayed on GEARS Facebook page.
  iii. There will be no restriction on retries as every team can take **maximum retries** within the given time but the time will be calculated as a whole.
  iv.   Once the team has raised the flag for retry, the score will be reset to **zero points**.
  v.   Once the team is ready and whistle has blown, **time will be started**.
  vi.   Referee will **force retry** if robot damages the arena.
  vii. Teams can take retry by saying **retry** and raising the **white flag** simultaneously.
  viii. Teams can freeze the robot by saying **stop** and by raising the **green flag** simultaneously.
  ix.   No Points will be deducted for retry.

2.2 Head to Head Matches

Once the teams have shown some potential, they'll qualify for head to head matches where they'll go head to head with other teams. Head to head matches will be a knockout round. You lost a match means you are out of the competition. Each team will be given **3 minutes** to run their robots.

  i.   Each team will be permitted 1 minute before the match to check their robot (None of the teams can run their robot on the main arena before match).
  ii.   After heats round, matches schedule will be displayed on GEARS Facebook page.
  iii. There will be no restriction on retries as every team can take **maximum retries** within the given time but the time will be calculated as a whole.
  iv.   Team will compete against the other participating team. Loosing team will be knocked out of the competition.

v.   If points of both the teams are equal, decision will be made based on time taken by both teams. The team with shortest time will be declared the winner.

vi.   If both the teams have scored a zero point then the team who has covered the most distance will be declared the winner.

vii. Once the team has raised the flag for retry, the score will be reset to **zero points**.

viii. Once the teams are ready and whistle has blown, **time will be started**.

ix.   Referee will **force retry** if robot damages the arena.

x.   Teams can take retry by saying **retry** and raising the **white flag** simultaneously.

xi.   Teams can freeze the robot by saying **stop** and by raising the **green flag** simultaneously.

xii. No Points will be deducted for retry.

xiii. Color strips will be of 3x3 inches in size.

3. Theme of the Competition

This year's ROBOTEK '20 theme focused on building an "**AUTONOMOUS EMERGENCY ROBOT**" that will have to deliver first aid kits at the points indicated in the arena. Robot will have to make its way through different interrupts and hurdles in its way. Robot will continue to find the way until it has reached the destination. The robot may have interrupts in its way where there will be no guidelines. So, participating teams need to design a robot which can reach the destination by crossing all the interrupts in the way.

    i.   Contest Arena is made up of **white laminated wooden sheets** (Lasani Sheet).

   ii.   There will be **no wall** on the sides of arena.

  iii.   The **arena is 8 feet wide and 10 feet long**.

  iv.   Size of the **line will be 1.5** inch throughout the arena.

   v.   Place of human models can be changed in head to head matches but the position of human models will be same at both the sides of arena.

  vi.   The robot will start running from the **start position "A"** and will have to follow the line till the **finishing point "H".** Only possible way for robot to win the competition is to reach finishing point in less time by running accurately on the arena.

  vii.   The Robot must **follow the provided path** at all the points.

 viii.   For Modular University Category only **table tennis ball is** allowed.

3.1 Modular University Category

    i.   Robot will start from point "A" and will finish at point "H" following the points B, C, D, E, F & G.

   ii.   Robot will have to detect the **boxes** at point "B, D and F".

  iii.   Robot will have to pot the **balls** at point "C, E and G".

3.1.1 Points

Table 1 - Modular University Category Points Table

Task	Points
Task A - Start	0
Task B - Detecting the 1st Box	10
Task C - Potting the 1st Ball	10
Task D - Detecting the 2nd Box	20
Task E - Potting the 2nd Ball	20
Task F - Detecting the 3rd Box	10
Task G - Potting the 3rd Ball	10
Task H - Finishing the Arena	20
Total	100 Points

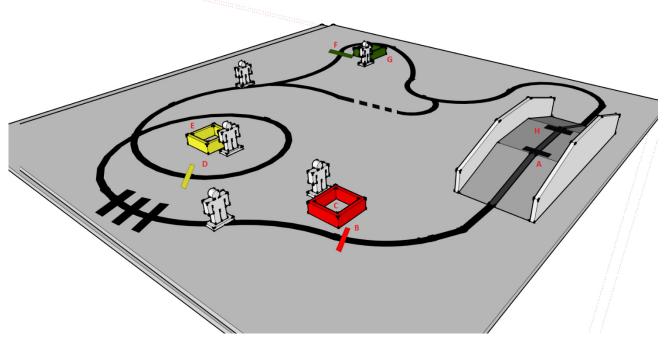## *3.1.2 Arena for Modular University Category*

Figure 1 - Modular University Category Arena

4. Rules and Regulations

Following rules will be initiated for smooth execution of the competition:

4.1 General

  i. LEGO Mindstorm EV3, NXT and any other similar kits can be used for the competition.

 ii. Judges can stop any robot at any time if they feel that it is performing, or is about to perform any action that is dangerous or hazardous to people or any equipment.

iii. You can find all the relevant information from GEARS official page. You can also text on GEARS official page for any information.

 iv. Any correspondence with any official of GEARS via E-mail or telephone or any other means will not be considered as rule.

  v. If team feels that they have faced any kind of injustice by the referee or judges they can launch a protest by filling the protest form (attached at the bottom of the document) within 30 minutes after the match.

 vi. Judge's decision will be final in all cases.

4.2 Teams

  i. A team can consist of maximum 5 members.

 ii. A team must have a valid team name and team logo.

iii. A team must be from HEC registered institutes.

4.3 Match Rules

  i. The qualifying teams will go against each other in a knockout format. In each match, each team will go against each other, running their robots' side by side in competition arena.

 ii. Team will be declared as **Team Red** or **Team Blue** based on the coin toss before every match.

iii. Team Red will run their robot on the right side and Team Blue will run their robot on Blue side.

 iv. Once turned on, the robot must be **self-controlled** without any human intervention.

  v. **Remote control** of any sort (wired or wireless) cannot be used. Participants are not allowed to touch their robots or enter the arena after startup.

 vi. Once the whistle is blown, participants will get **3 minutes** to complete the task.

vii. If Participants see that their robot has lost the track and is facing problem in finding the path then they can ask for a retry by raising the white flag.

viii. Once the white flag is raised, the participant can pick the robot and restart the operation.

ix.   Participants needs to keep in mind that all points scored will be reset to **zero** and the potted ball will be loaded to robot again.

x.   Robot may touch the objects but it must not displace any object inside the arena as it will result in force retry.

xi.   In case of draw, the team may be asked for a rematch or winner may be decided on a coin toss as per discretion of judges.

(Other match rules for Heats Round and Head to Head matches are stated above)

4.4 Robot's Power Supply

i.   Robot needs to be battery powered and no use of direct wired connection is allowed.

4.5 Disqualification

i.   If the team misbehaves with any stage officials, the team will be disqualified straight away.

ii.   If the team is found using any Wi Fi, Bluetooth or any other module which can help the robot to be controlled wirelessly will result in disqualification of the team.

iii.   If the team is found using any means which are against the fair game rules then it can be disqualified.

4.6 Deduction of Points

In following conditions, points of the team will be deducted:

Table 2 - Deduction of Points

Sr. #	Condition	Penalty
1	If robot hits a human model	-5 Points

4.7 Components List

LEGO Mindstorm EV3 kit, NXT kit or any other similar kits can be used for Modular University category.

4.8 Protest Form

Protesting team will have to pay non-refundable amount of Rs. 2000/- to launch a protest. In case of valid protest, the amount will be refunded.

APPENDIX - I

GARRISON ENGINEERING AND ROBOTICS SOCIETY
Robotics Lab adjacent to Lab 80, 1ˢᵗ Floor, Old Building
Contact: 0335-1549132 | www.facebook.com/lgugears

<u>Protest Form</u>

Category (LEGO/ Indigenous)

Team Code

Team Name

University Name

Reason of Protest:

_____

_____

_____

_____

Leader's Signature: _____

Match Start Time: _____   **Match Finish Time:** _____

Judges Remarks:

_____

_____

_____

_____

Judge Signature: _____