

STATE LEVEL ROBOT MAKING COMPETITION

**“ROBOFEST - 2.0”**

UNDER SCIENCE, TECHNOLOGY AND INNOVATION (STI) FUND

PROPOSAL GUIDELINE & APPLICATION FORMAT



Investing in Science: Investing in the Future!

GUJARAT COUNCIL ON SCIENCE AND TECHNOLOGY

DEPT OF SCIENCE AND TECHNOLOGY, GOVT OF GUJARAT

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**Dept of Science & Technology, Govt of Gujarat**

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**“ROBOFEST- 2.0”**

**1.0 Introduction:**

Gujarat Council on Science and Technology (GUJCOST) working under the aegis of the Dept. of Science and Technology, Govt. of Gujarat is the nodal agency for the S&T promotion, awareness, education, research and development through its various programmes and outreach activities across the state. GUJCOST is also the implementing agency of the Science, Technology and Innovation (STI) Policy of the State. GUJCOST has a major role in implementing the Science, Technology and Innovation (STI) Policy of the state by supporting research and development activities on emerging fields of Science and Technology and on state and national priority areas.

In the STI policy, one of the identified emerging areas is Robotics and Artificial Intelligence. Presently, in Gujarat, very few engineering institutions are having separate specialization on robotics and artificial intelligence. In order to explore more in this emerging field and to provide a skill set among students, GUJCOST proposes the organization of Robot Making Competition (ROBOFEST- GUJARAT 2.0) among students in STEM institutions in the state. The programme consists of three levels and in seven categories of robot making.

**2.0 Robot Making Competition (ROBOFEST- 2.0)**

The programme has a great significance on the learning exploration of STEM students as it involves working on new and innovative idea, preparing a solid proof of concept and finally to develop the proto-type robot in 7 different robot making category. This is a very good process of robot making which has a great market value in terms of new startups and entrepreneurship among the students in the state and prototype models of robots will be displayed at the Robotic Gallery in Science City and the Regional Science Museums. Hence the process has also the potential of design and development of new robots as an exhibit in an indigenous manner and to promote the present campaign of Vocal for Local.

In view of the above, it is proposed to continue the ROBOFEST - 2.0 competition in a very professional manner with few minor changes in the rules of the previous competition and they are as follows:

1. To develop futuristic application-based robots.
2. To include Pipe climbing robots (capable of taking bends), exoskeletons and Microrobots
3. Use of commercially available kits is discouraged and if found so the college will be penalized and blacklisted for next competition.
4. Participants can use free wares
5. At the end of the competition the team has to submit a finished product.
6. Electrical and electronic items can be used off the shelf.

In view of the above, GUJCOST proposes ROBOFEST - 2.0 with following category of making robots:

1. Four-legged robot with quadrupedal motion
2. Submarine or under water robot
3. Rovers (Eight wheels, 3 to 4 free size with a camera mounted, auto memory/ GPS guided)
4. Prosthetic limbs with remote sensors
5. Pipe climbing robots capable of taking bends
6. Powered Exoskeletons for support of knees/hips
7. Micro robots (6 cm or below)

Robots developed under this scheme should not be submitted/ showcased/ demonstrated/used in any competition/event without prior written permission from GUJCOST.

Any robot submitted/ showcased/ demonstrated/used in any competition/event shall not be submitted under this scheme. If found so, it will be deemed treated as disqualification.

GUJCOST will provide financial assistance in each stage of development for such robots. The description of each of above category of robotics which is expected from GUJCOST are as under:

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Category** | **Primary Objective** | **Secondary Objective** |
| 1 | Four-Legged Robot | A robot to be created with 4 limbs or legs. Demonstrated movement (front, back, left and right) through biomimicry by 4 legs. No types of wheels or roller or blades are allowed. No readymade kits/chassis are allowed | Wireless battery powered control of the robot with ability to climb heights (steps of greater than 20-degree incline) and stay in motion for at least 5 minutes. |
| 2 | Underwater Robot | A underwater robot which has the ability to be completely submerged and has the ability to move in 3 degrees of freedom (up, down, front back and left right). Needs to be immersed at atleast 4 feet depth. | Wirelessly controlled and battery-operated underwater robot which stays below 4 feet depth for at least 5 minutes. |
| 3 | Rover | A ground-based robot with at least 6 wheels and direct or coupled power transmission to at least 4 wheels. Ability to move through wireless and battery control on 4-inch-tall grass and 45-degree incline (separately). No readymade kits/chassis are allowed. | Autonomous drive enabled with GPS and some form of obstacle avoidance, with a start point and end point 500m away with at least 2 obstacles in the best path. |
| 4 | Prosthetic limbs | A human forehand with demonstrated independently actuating 4 fingers and thumb. Ability to pick at least 2 different objects with at least 2 repetitions. No readymade kits/chassis are allowed | Picking up at least a 400ml glass of water filled with water, holding it for 1 minute visibly above the surface and putting it back down, and no spillage of water in the process. No human intervention in the complete mechanical chain. |
| 5 | Micro/Swarm Robotics | A group of at least 5 ground vehicles or aerial vehicles, with only one control unit. To have coordinated motion by moving together forward, backward, left and right (100m each direction). | Ability to form 3 different shapes (circle, square, triangle) starting from a straight line, making one shape and going back to a straight line. |
| 6 | Powered Exoskeleton | It should involve sensors, actuators, mechanical structures, algorithms and control strategies capable of acquiring information to execute a motor function.  Light wearable brace support suit for knees. | By integrating DC motors, rechargeable batteries, and an array of sensors with computer-based control, upper-body attempts to walk are detected and used to initiate walking processes. |
| 7 | Pipe Climber | A robotic mechanism which can climb a pipe going vertically upwards which is at least 30 feet above the ground, get to the top and stay there for 1 minute and come down at the exact same speed by which it went up. The pipe can be of uniform thickness and the robot can be powered through wires. | Battery operated robot which has the ability to climb a 30 feet pipe (going vertically upwards) with at least 2 90-degree bends, get to the top and stay there for 1 minute and come down at the exact same speed by which it went up. |

**3.0 Eligibility of Team**

a. Any registered and affiliated institute/university of Gujarat running STEM programme

(Science, Technology, Engineering, Mathematics).

b. Each participatory team must be comprised of maximum 5 Students and minimum 3 students (at least at the level of Diploma / Undergraduate) along with one Faculty as Mentor/Guide.

c. The mentor must be a regular faculty member at any of State University/affiliated

Institutes/College and with a minimum of three years of experience in STEM as faculty.

d. The Intellectual Property involved during the design; the execution stage will pertain to the team. However, GUJCOST Patent Information Center may help in filing a patent on request.

e. Any private company/industry involved in manufacturing/making of robots are not eligible for the competition.

**4.0 Level/Stages for the competition:**

Each interested team has to go through four level submission for the competition. Each stage will be separately evaluated.

Level 1: Ideation / Concept Note Stage:

Teams will be asked to submit their concept note in the form of mechanics, the methodology of making robot, components and design of the robot. The detail description of their technology in any of the above seven categories, teams can propose their robots.

Out of the submitted proposals, each proposal will be evaluated by the framed committee and each successful proposal will receive Rs. 50,000/- as seed money for submission of Proof of Concept.

Level 2: Proof of Concept Stage

Each winner team of Level 1 will be allowed to submit their small functional prototype within the time frame of maximum 4 to 6 months. Teams have to submit their working small model of the robot as proposed in their concept note and need to show during Level 2 competition organized. Each submitted Proof of Concept working prototype will be evaluated by the Technical Review Committee. The successful team will be supported by prize money and certificate as mentioned in Table:1.

Level 3: Prototype submission of Actual Robot Proposed:

Each winner team of Level 2 will be eligible to submit their real Prototype working robot as proposed in earlier two stages. The team will be given a maximum of 6 to 8 months to submit their prototype robot with all functions and specification in open competition. The working robot will be evaluated by the team of experts identified and winner team will be awarded Rs. 5.00 lakh for each above-proposed robot in seven categories.

Level 4: Installation and Commissioning of Robot

Each winner team of Level 3 will have to compulsory give total component details of robotics and their make to GUJCOST. The team will be asked to do a demo, training of staff of the respective gallery with the commissioning of the Prototype robot with full accessories.

**5.0 Evaluation of Each Stage:**

Each stage/level as defined above will be evaluated by a separately assigned committee comprised of Three to Four domain experts along with field expert with a strong background of robotic design and development.

Level 1:

For each seven categories of robots proposed, the best ideation will be considered as the winner team and will be entitled for the prize and certificate.

Level 2:

For each level 1 winners, all are entitled to submission of their proof of concept of the robot and from each category of the robot which will be examined by the expert committee. On the approval of proof of concept and recommendation of the committee, each of the team are eligible for receiving prize money as per the Table:1.

Level 3

The team in each category of Level 2 are eligible and entitled for submission of Prototype of their robot as final stage submission. Each submitted robot will be examined and evaluated by the expert committee and on approval and recommendation of the committee, each of the winning team will be entitled for prize money of Rs.5.00 lacs on successful installation and commissioning.

**6.0 Action Plan**

Announcement of the competition will be done through advertisement in leading Newspapers and GUJCOST website in the month of October 2020. The teams would be registered through an online form created by GUJCOST and will be allowed to submit their concept note at GUJCOST office by **Date 31st December, 2020.**

After receiving all the proposals, GUJCOST through the Technical Committee will evaluate each concept note and proposals and winners of the team will be announced. Each winner team will receive the first stage release of grant and certificate.

After the announcement of the winner team of stage 1, the same teams will be eligible for submission for Stage 2. The probable deadline for submission of Proof of Concept Robot of Stage 2 will be **Date 31st March 2021**. Each team will be evaluated based on component and working of the robot proposed, and the winner teams will be announced to submit of the final robot of Stage 3.

Stage 3 final robots will be required to be submitted through open competition and to be submitted by **31st July 2021**. The final robot submitted will be evaluated by the Team of Experts and winners will be announced by GUJCOST.

**9.0 Financial Implication**

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| --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Types of Robot** | **Prize money (Rs. In lakh)** | | | **Total** |
| Level-I (Ideation) (3 awards in each category) | Level-II (Proof of Concept) (2 awards in each category) | Level-III (Prototype) (1 award in each category) |
| 1 | Four-legged robot with quadrupedal motion | 0.50 | 2.00 | 5.00 | 7.50 |
| 2 | Submarine or under water robot | 0.50 | 1.00 | 5.00 | 6.50 |
| 3 | Rovers (Eight wheels, 3 to 4 free size with a camera mounted, auto memory/ GPS guided) | 0.50 | 2.00 | 5.00 | 7.50 |
| 4 | Prosthetic limbs with remote sensors | 0.50 | 1.00 | 5.00 | 6.50 |
| 5 | Pipe climbing robots capable of taking bends | 0.50 | 1.00 | 5.00 | 6.50 |
| 6 | Powered Exoskeletons for support of knees/hips | 0.50 | 2.00 | 5.00 | 7.50 |
| 7 | Microrobots (6 cm or below) | 0.50 | 1.00 | 5.00 | 6.50 |
| Total | | 3.50 | 10.00 | 35.00 | 48.50 |
| Total for all awards for each type of robot | | 10.50 | 20 | 35 | **65.50** |

**GUJARAT COUNCIL ON SCIENCE AND TECHNOLOGY**

**Dept. of Science and Technology, Govt. of Gujarat**

**Application format for the**

**IDEATION STAGE FOR ROBOT MAKING COMPETITION**

**ROBOFEST, GUJARAT-2.0**

1. Proposal submitted for Robot: (Please tick mark the category of robot proposed)
2. Four-legged Robot with quadrupedal motion
3. Underwater Robot or Submarine Robot
4. Rovers (Eight wheels, 3 to 4 feet size with the camera mounted, auto memory/GPS guided.
5. Prosthetic limbs with remote sensors.
6. Pipe Climbing robots
7. Powered Exoskeletons
8. Microrobots
9. Type of Institution:

Government: ☐ Private-Aided: ☐ Private-Unaided: ☐ Local Body: ☐

1. Name of Institute/Department/Organization:
2. Complete Postal Address with Pin code:
3. Name of affiliated University/Board Name:
4. Mentor/Coach/Faculty Guide Name:
5. Designation of Mentor/Coach/Faculty Guide:
6. Experience of Mentor/Coach/Faculty in years:
7. Email address:
8. Mobile Contact No:
9. Office No:
10. Proposed Team of Making robot: (Maximum five participant per team allowed)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sr. No. | Name of Student/Research scholar | Institute Name | Department | Programme enrolled | Year (I/II/III/IV) | Mobile No. |
|  |  |  |  |  |  |  |
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1. Capability of the Organization / Individual specific to Robot Making:
   1. Expertise available with the Mentor/Coach/Faculty Guide: (Not more than 100 words)
   2. List of Participation in past in any Robot Making Competitions:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Event Name | Venue | Type of Competition (State/national/International) | Type of Robot submitted | Achievement |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

1. Name of the authority in whose name Cheque / Demand Draft should be drawn.

Name of the Account Holder:

Name of the Bank:

Bank Account No:

IFSC Code:

MICR Code:

**UNDERTAKING**

I \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Mentor/Guide Name) on behalf of my team authorized to give undertaking that on selection of our team at Level 1 (Ideation) stage, we assure and commit to participate in the subsequent levels and to submit Level 2 (Proof of Concept) and Level 3 (Proto type) robot as per guidelines of the GUJCOST without fail, otherwise GUJCOST will take necessary action to recover the fund if disbursed for any Stage.

Sign of Mentor/Guide \_\_\_\_\_\_\_\_\_\_\_

Sign of Director/Principal of Host Institute \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Stamp of Institute/University

**TECHNICAL DETAILS FOR PROPOSED ROBOT**

(Wherever necessary separate sheet/page is allowed to attach; Institute may submit extra details if find necessary)

* + - 1. Type of Robot:
      2. Robot Assembly Design (Proposed Diagram): Drawings each part of the robot are preferred as an attachment. (CAD drawings are preferred)
      3. Components to be used: (Enlist all the components with their make/company in four groups as enlisted in the following table:
         1. List of Structure components: like beams, bushes, shafts, belts, plates, pins, pullies, wheel, connectors, batteries, motors, etc.
         2. List of Motion Components: like Chain, sprockets, flaps, etc.
         3. List of Electronics Components: like Smart ports, switches, joysticks, controllers, LED/LCD screen, power supply, programming components, etc.
         4. List of Other Accessories: Clothes, plastic eyes/ear/feeling like real all external components which are for the look.
      4. The methodology of Making Robot: (Please write Entire Technical Specifications of Proposed Robot with brief notes and diagrams)
      5. Application of proposed Robot in a societal context: (Not more than 100 words)
      6. Size of robot proposed for Proof of concept (Small version):

a. Length in cm\_\_\_\_\_\_\_\_ b. Width in cm \_\_\_\_\_\_\_\_\_\_ c. Height in cm \_\_\_\_\_\_\_\_\_\_\_

* + - 1. Size of robot proposed as Proto type (Actual Version)

a. Length in cm\_\_\_\_\_\_\_\_ b. Width in cm \_\_\_\_\_\_\_\_\_\_ c. Height in cm \_\_\_\_\_\_\_\_\_\_\_

* + - 1. Timeline for Robot making with milestones. (Divided in activities vs. no. of days)
      2. Please attach the proposed outline (photograph) for understanding of the evaluation committee.

-x-x-x-

**ENDORSEMENT FROM THE HEAD OF INSTITUTION**

ROBOT CATEGORY:

1. Certified that the Institute welcomes participation of Prof./Dr./Mr./Mrs./ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_as the Mentor of the following students to participate in the ROBOFEST 2.0 Competition:

1.

2.

3.

4.

5.

1. The basic facilities and such other Administrative facilities as per the need of the robot category, will be extended to the team throughout the duration of the project.
2. Institute assumes to undertake the financial and other management responsibilities of the project.

Date:

Place: Signature & Seal of Head of Institute