URSC

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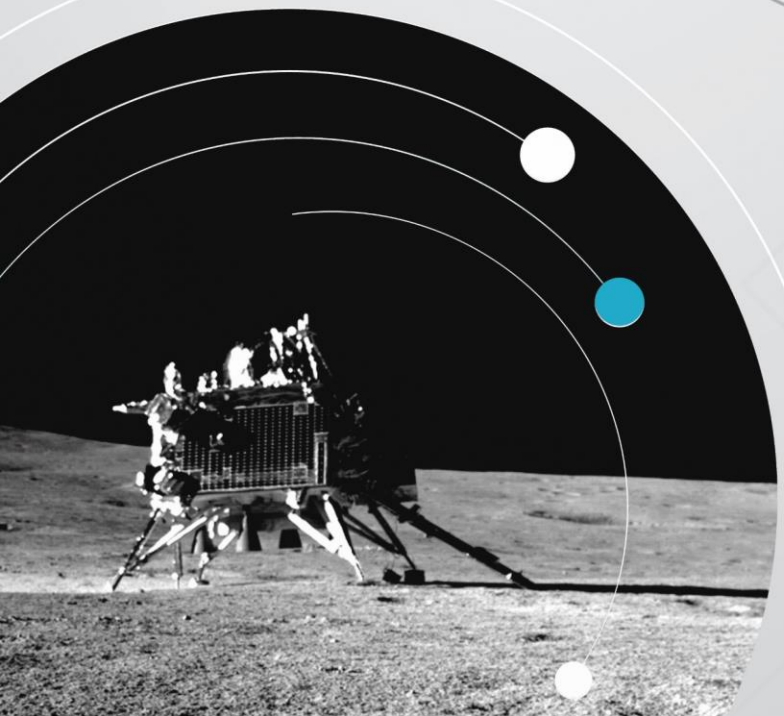
IRoC-U

ISRO Robotics Challenge - URSC 2024

Let's build a space robot



QUALS RULE BOOK V1.0

February 2024

U R Rao Satellite Centre

CONTENTS

Version Updates

Version	Section	Date
V 1.0	Original Document	02.02.2024

1. PREAMBLE

Indian Space Research Organisation (ISRO) successfully landed Chandrayaan-3 Vikram on lunar surface and the rover Pragyan explored region near to the southern pole of Moon. As a natural extension to this accomplishment, it is time to look at future robotic exploration missions to Moon and other planetary bodies. ISRO has been constantly striving to create unique opportunities for academia & industry to participate in technology developmental activities commensurate with organisational objectives. In line with these objectives, U R Rao Satellite Centre (URSC) solicits from the youth of India, innovative ideas and designs of robotic rovers for future missions through the conduct of 'ISRO Robotics Challenge, URSC-2024'. This is an invitation for student community for design and realisation of a 'Wheeled/Legged Rover', with the scope of the challenge encompassing the development of complete hardware and software. Details of the same are discussed in this document. The objective is to provide development opportunities in space robotics to the participating entities and to leverage creative thinking among the youth of our Nation for ISRO interplanetary missions. This challenge is also expected to play an important role in augmenting ISRO's capabilities in space exploration.

All interested are encouraged to participate in this challenging competition and join hands with ISRO towards the advancement of space science & technology in the country.

2. GENERAL INFORMATION

2.1. Introduction to IRoC-U 2024

ISRO is foraying into the development of state-of-the-art Space Robotics, Artificial Intelligence and Machine Learning technologies. The technologies are being developed to meet the futuristic mission needs of ISRO viz., ISRO In-orbit Servicer Mission, Lunar sample return mission, Docking in Space (SPADEX), Mars Lander Mission etc.

In order to provide a greater opportunity for the students of the country to propose innovative solutions in the area of space robotics, it is planned to organise "ISRO Robotics Challenge-URSC 2024 (IRoC-U 2024)" with a tagline of "Let's build a space robot". The solutions provided by the students in IRoC-U 2024 stand chance of getting incorporated into ISRO's future interplanetary robotics missions.

IRoC-U 2024 consists of an engineering project where the Institutional teams build robots to compete on an extra-terrestrial inspired arena, performing tasks based on the realistic challenges in the domain of space robotics. IRoC-U is being planned as a platform for co-development of technologies in the area of space robotics through the medium of nation-wide challenge.

2.2. Objectives of the Challenge

a. To provide a standardised platform for exploring the area of space robotics.
b. To develop a deeper understanding of space robotics and its applications among student community with an intention to enhance their communication, collaboration, inquisitiveness, problem solving ability and flexibility skills that will benefit them in their academic and professional lives.
c. To enable students to join hands with ISRO towards development of futuristic technologies needed in the area of space robotics.

2.3. Outcome for Student Community

a. Identify, formulate, and solve complex engineering problems by applying principles of mathematics, science and engineering.
b. Apply engineering design to produce solutions that meet specified needs.
c. Communicate effectively.
d. Collaborate with a team, provide inclusive leadership, establish goals, plan tasks, and meet objectives.
e. Formulate and conduct appropriate experiments, analyse and interpret test and analytical data and use engineering judgment to draw conclusions.

2.4. Schedule of the Events as on 31/1/2024

This challenge is a milestone-based event with continuous evaluation till the completion of the field event. This section provides the list of milestones the participating teams will encounter during the IRoC-U 2024. The timeline with important dates are as follows:

#	Description	Date
1.	Announcement of the challenge	08.11.2023
2.	Submission of registration form along with proposal	20.11.2023 to 15.01.2024
3.	Announcement of Selection of teams for Quals	31.01.2024
4.	Release of detailed Field Arena document	29.02.2024
5.	Quals-1: **Hardware functionality demonstration**- video submission by teams	01.04.2024
6.	Quals-1: **Rover functionality demonstration** - video submission by teams	01.05.2024
7.	Quals-1: **Design & Test report submission**	01.05.2024
8.	Selection of teams for live video demonstration from Quals-1	07.05.2024
9.	Quals-2: **Live video demonstration** by selected teams	30.05.2024
10.	Selection of teams for Field Round (maximum of 10 teams will be selected)	05.06.2024
11.	Release of task particulars for Field Round	10.06.2024
12.	Operation Readiness Review and Feedback	01.07.2024 to 06.07.2024
13.	Preparatory Day for the teams	04.08.2024
14.	**ISRO Robotics Challenge Day**	05.08.2024 and 06.08.2024
15.	Awards Ceremony on National Space Day	23.08.2024

Note 1: Organisers reserve the right to change the dates depending on exigency of situation.

Note 2: All deadlines are at 8.30 PM (IST) on the respective dates.

Note 3: Organisers reserve the right to refine the task details of the challenge as we progress.

2.5. Venue

The final onsite competition, where the teams shall perform the required tasks, is planned to be conducted in URSC Bengaluru Campus in the Month of August, 2024. For information about the IRoC-U 2024 competition venue, please follow our updates on the website.

2.6. Contact Information

Website address: https://www.ursc.gov.in/IRoC-U2024

Email address for Teams: irocu2024@ursc.gov.in

2.7. Awards and Recognitions

The first three teams will be awarded based on the evaluation by jury and fair play attitude of teams. Additionally, two consolation prizes are also planned. The awards in the form of cash and institute trophy are planned as follows:

1st place	Rs 5.0 Lakhs along with Institute trophy
2nd place	Rs 3.0 Lakhs along with Institute trophy
3rd place	Rs 2.0 Lakhs along with Institute trophy
Two consolation prizes	Rs 1.0 Lakh each along with Institute trophy

All the members and mentors of the teams qualifying and participating in the Field Round on the challenge day will be awarded an appreciation certificate.

All the members and mentors of the teams qualifying for the Quals will be awarded participation certificate.

First three Prize winning rovers (viz., places 1st, 2nd and 3rd) will get commemorative sticker from the organisers.

2.8. Financial Assistance

Each team qualifying for the Field Round and participating on the challenge day will be provided with financial assistance of Rs 2.0 Lakhs.

2.9. Intellectual Property Rights

Intellectual properties (IPs) generated by the teams qualifying for the Field Round during the IRoC-U 2024 challenge shall be sole property of URSC-ISRO. These teams shall enter into non-disclosure agreement with URSC-ISRO.

The rover design arrived by the teams qualifying for the Field round shall not be used by the teams in any other competition without the written consent from the organisers.

2.10. Quals Model Funding

The organisers shall not provide funding in any form to the teams participating in Quals Round. However, there are no restrictions on the teams with regard to private funding. The teams may carry a logo of size 10 cm x 15 cm of the funding agency during Quals round only.

2.11. Team Lead Responsibilities

- Each team should identify one member as team lead.
- Any communication from the organisers will be sent to team lead only and any query/clarification should also be raised only using the team lead's registered email id.
- No response will be provided to the email addresses other than the registered email id. Mails from any other address will be treated as spam.

2.12. Selection Process

Teams participating in Quals-1 will be shortlisted for Live Video Demonstration, which forms Quals-2. Further, a maximum of 10 teams will be selected for the Field Round based on the evaluation of design and demonstration of prototype from Quals-2. The decision of the organisers in this regard will be final and binding.

- **Prelims Requirement**: Registration and Submission of Proposal Report
- **Quals Requirement**:
    - Quals-1: Submission of videos depicting performance of rover by executing specified tasks (Hardware Functionality Demo followed by Integrated Rover Functionality Demo), submission of design report and test report
    - Quals-2: Live video demonstration of the prototype by the teams selected from the Quals-1
- **Field Round Requirement:** The final onsite competition, where the teams shortlisted from Quals-2perform the required tasks, is planned to be conducted at URSC Bengaluru. In the field round, arena size will be around 12 m x 9 m. The obstacles and craters will be randomly distributed. The participants will not be provided with any details regarding the coordinates of obstacles and craters. The rover is expected to identify and locate the sample of interest as well as the container into which the sample has to be placed. The rover shall also perform the task of navigating to the sample and container based on real-time assessment of the terrain conditions. The rover shall finally park itself at a defined position. All the operations of this round need to be carried out autonomously by the Rover with inputs derived from its sensors and based on the logic/intelligence built into the Rover. .(Details shall be provided in field arena document).
- **In order to clearly bring out the major differences between Quals-2 round (Live video demonstration) and Field Round, the following table has been evolved:**

Table 1: Differences between Quals-2 and Field Round

Quals-2: Live video demonstration	Field Round
Fully defined flat arena (0˚ slope) with arena size of 10m x 5m	The arena size is 12m x 9m (approx..) with irregular slopes between 0˚ to 15˚
Coordinates of the obstacles and craters are provided	Coordinates of the obstacles and craters will not be communicated apriori
Shape of the obstacles and craters are well defined	Shape of the obstacles and craters will be irregular but limited to dimensions used in qual-2 round.

The current document outlines the rules for the Quals. The rules for the Field Round and shall be uploaded later.

3. QUALS REQUIREMENTS

3.1. Quals Task Requirements

One of ISRO's future goals is to collect sample from a location and deliver it to the lander for sample return mission. The area has to be examined by the rover based on its on-board instruments that support reconnaissance activities. Another major goal is to collect surface samples of the lunar/planetary soil and return to Earth for further analysis. The challenge is modelled on these envisaged mission goals.

The teams may kindly note that the same rover has to be used for the entire Quals round. The teams may also plan the designs such that the capabilities envisaged in the Field Round can also be incorporated without major changes/challenges if the team gets shortlisted.

3.2. Rover and Manipulator Requirements

a) Specifications: Each rover must be compliant with the specifications provided in Table-2 below.
b) The rover shall be a standalone, mobile platform capable of working in non-GPS environment.

Table 2: Rover and Manipulator Specifications

Rover		
1	Type	Wheeled/Legged
2	End to End Dimension (Rover Alone) Length X Breadth X Height	< 1 m X 1 m X 0.8 m
3	Mass (Rover with Manipulator arm)	< 50 kg
4	Slope climbing capability	Minimum 15˚
5	Obstacle climbing capability on slope	Minimum height of 150 mm (No colour coding is employed for obstacles)

6	Power Source	Battery operated only
7	Communication	RF link(s) in radiation mode only
8	Gravity	Under Earth's Gravity
Manipulator		
9	Type	Serial/Parallel
Sample Tube		
10	Payload Mass	200±10 gm
11	Dimensions (Length & Diameter)	125 mm & 80 mm Red in colour
Sample Container		
12	Dimensions (Length & Diameter)	150 mm & 150 mm Blue in colour

c) The use of satellite-based navigation systems, external markers, or local positioning systems is strictly prohibited. This rule emphasizes the need for participants to rely solely on the rover's on-board sensors and programming for navigation, mirroring the challenges faced by an actual planetary rover on distant celestial body where traditional Earth-based navigation aids are unavailable.

d) The battery capacity has to be large enough to ensure that there is no need to change/charge the battery during any of the tasks.

e) The rovers having minimum mass, power consumption, overall size while displaying the ability to complete the tasks in minimum time will be duly recognized during the evaluation process.

f) Usage of readymade robotics kits is strictly prohibited.

g) All rovers must be equipped with a "kill switch" placed on the rover's exterior, accessible and visible at all times. This switch must cease any movement of the rover and shut the power drawn from batteries in case of an emergency.

h) Teams are required to build their own rover. Teams are recommended to use COTS (Commercial-Off-The-Shelf) components.

i) The speed of the rover is expected to be at least 1 cm/s .

j) The Team should be able to control the rover via a radio link in real-time. Radio communication with the rover shall be designed taking into consideration the regulatory norms on frequencies and power levels. It is expected that the maximum radial distance between the rover and the base station (eg., participant's laptop) would be 25 m.

k) The type of manipulator arm and degrees of freedom is to be chosen appropriately by the team.

l) The sample tube should not be damaged while gripping and handling.3D printed ABS material or equivalent material may be used for the sample tube.

m) The rover should be stable during the entire range of operations including those of the manipulator arm. The instability of rover during operation will lead to negative scoring.

n) The rover and manipulator shall be built to handle the challenges of the terrain and the associated dust. The operational temperature range shall be between +20°C and +40 °C.

3.3. Quals-1: Hardware functionality demonstration

In this demo the teams are encouraged to upload video of the hardware demonstrating the below mentioned tasks:

a) Rover structure readiness
b) The Wheel mobility testing in open loop with a minimum speed of 1 cm/s
c) Manipulator working in open loop where it needs to travel to a specified point defined by the participant, pick the object and place the object at a specified point defined by the participant
d) Demonstration of the functionality of sensors that are going to be used.

While it is not mandatory to upload this video, the teams are encouraged to do so in order to showcase their progress in building the rover to the organisers.

3.4. Quals-1: Rover functionality demonstration

The team shall submit the video of the rover performing the specified tasks mentioned below. The evaluation of the teams will be based on the video sent by the participants and up to 30 teams will be selected for live video demonstration (i.e., for Quals-2).

The video shall cover the following operations performed by the rover in a sequence:

a) Compliance of the specifications:
    - Mass (Rover with manipulator arm) < 50 kg
    - End to End Dimension (Rover Alone) Length X Breadth X Height: < 1 m X 1 m X 0.8 m
b) Mobility on 0˚ slope
c) Mobility on 15˚ slope with a velocity in the range of 1cm/sec to 5cm/sec. The rover needs to be on the flat surface at the beginning of this activity and subsequently needs to climb the slope.
d) Climbing 150 mm X 150 mm X 150 mm cube (obstacle) which is placed 1 m away from the starting point on a flat surface. The entire Rover needs to completely cross the obstacle.
e) Traversing through 200 mm diameter hemispherical crater which is created 1m away from the starting point which is on a flat surface. The entire rover needs to completely cross the crater.
f) Detection and avoidance of the craters and obstacles using sensors in loop:
    - The rover has to travel 1.5m by identifying and avoiding the obstacle of 300 mm X 300 mm X 300 mm dimension cube in real time without any human intervention. The obstacle will be placed at 0.5m from the starting point. Stopping mid-way or contact with the cube will attract penalty points.
    - The rover has to travel 1.5m by identifying and avoiding the 400 mm diameter hemispherical crater in real time without any human intervention. The obstacle will be situated at a distance of 0.5m from the starting point. Stopping mid-way or entry into the crater will attract penalty points.

g) Manipulator sample tube picking and placing demonstration – (weight & dimension of the sample tube shall be shown to be as specified in table 2) - The manipulator needs to pick the object clear off the ground (contact with the ground shall be avoided once the sample is picked). The Rover then needs to travel 0.5m and place the sample tube on the ground.
h) Live telemetry feed demonstration – The rover needs to send the sensor data, live path planning data in graphical form or as coordinates back to the base station. The images of the obstacle, crater and sample shall also be sent to participants base station through RF link. This process shall be captured in the video for this particular task.
i) Kill switch demonstration – While the rover is in motion, power cut-off to all the actuators on assertion of kill-switch shall be demonstrated.

All the above tests may be performed at suitable location at participants' site preferably considering the arena conditions as proposed for Quals-2 (discussed in subsequent section). The team can make separate videos demonstrating all the tasks mentioned above and stitch all the videos into a single video and upload. However, the team can also make a single video demonstrating all the tasks mentioned in one go. The maximum length of the video shall be less than 40 minutes

3.5. Design & Test Report requirements

Design & test report needs to be submitted by the team along with the Rover functionality demonstration video. This design and test report must contain specifications, detailed design and calculations & test results.

The teams report can make use of the following pointers towards the generation of the design and test report:

- Rover Mobility
  - Mechanism design
  - Drive electronics design
  - Design calculations
  - Sensor system
  - Software requirements and its design details
  - Specifications of COTS components
- Navigation and identification
  - Algorithms
  - Software requirements and design details
- Manipulator
  - Mechanism design
  - Drive electronics design
  - Design calculations
  - Sensor system
  - Software requirements and design details
  - Specifications of COTS components
- Communications
  - RF design
  - Design calculations
  - Software requirements and design details

    - Specifications of COTS components
- Emergency response system
    - Kill switch design
- Analysis
- Test plan
- Weighing and dimensional measurement details of the rover (Rover alone)

The document shall be restricted to maximum of 70 pages.

3.6. Quals-2: Live video demonstration requirements

The selected teams need to prepare their rovers for live video demonstration in the arena specified by the organisers. Arena needs to be prepared by the participants at their respective locations.

a) Arena

Refer Arena and Task Details **V1.1** document (download from the website)

a) Size of the arena: 5 m X 10 m.
b) Filling material of arena: M-Sand
c) Terrain: Flat terrain filled with M-sand with distributed obstacles and craters as specified
d) Obstacles: Cube of dimension 150 mm forms traversable obstacle and cube of dimension 300 mm forms obstacles that need to be avoidedThe obstacles will be made out of wood and planted firmly in the Arena such that their positions are not disturbed when rover traverses over them.
e) Craters: Craters are created by scooping out sand from the arena. These craters will be approximately hemispheres with diameters of 200 mm (traversable) and 400 mm (to be avoided).
f) Boundaries of the arena need to be marked distinctly.

b) Navigation Task:

Refer Arena and Task Details **V1.1** document (download from the website).

The team is required to design and demonstrate the performance of rover's navigation by traversing from starting point to waypoint in commanded mode and subsequently in autonomous mode till the final parking. The requirements for the rover design need to be generated based on the following navigation tasks:

a) Obstacle identification using sensors: The obstacles given are of dimensions 150 mm X 150 mm X 150 mm and 300 mm X 300 mm X 300 mm. The sensors shall be capable of identifying the dimension of the obstacles.
b) Obstacle avoidance/traversal by mobility system: The rover must be capable of traversing over 150 mm X 150 mm X 150 mm obstacles while avoiding the 300 mm X 300 mm X 300 mm obstacles.
c) Hemispherical craters identification using sensors: The hemispherical craters of diameters 200 mm and 400 mm are to be identified. The sensors shall be capable of identifying the dimension of the craters.

d) Hemispherical craters avoidance/traversal by mobility system: The rover must be capable of traversing through craters of diameter 200 mm while avoiding the 400 mm diameter hemispherical craters.

Note: It is desirable to design the obstacle and crater identification algorithms to detect irregular shapes though it is not mandatory for the Quals round as it could be useful for the team in field round, if shortlisted.

c) Sample Picking, Placing and Final Parking Task:

Refer Arena and Task Details V1.1 document (download from the website).

- The sample pick and-place task needs to be accomplished by a manipulator arm mounted on the chassis.
- Target identification using visual sensors: A tube which represents sample to be collected forms the target for the Rover. Following are the details of the sample that needs to be identified successfully before being picked up:

  Details of sample (tube):
  - Mass: ~ 200 gm
  - Shape: Hollow Cylinder with closed ends
  - Size: OD 80 mm, L 125 mm (Approx.)
  - Colour: Red
- Picking and securely holding the sample: The sample tube needs to be picked up from the surface using a gripper. The sample then needs to be held securely by the rover before mobility is initiated
- Target location identification: A cylindrical container of diameter 150 mm and height 150 mm, which is placed at the target location, needs to be identified
- Rover mobility: Rover shall autonomously plan the path and navigate to reach the location of the sample container
- Unloading and placement: The rover needs to approach target and unload the sample into the cylindrical container.
- Final Parking: After dropping the sample, rover must traverse radially and position itself just outside the circle of 1500 mm diameter centred at the cylindrical container.

d) Task Duration:

Total time available to execute all the tasks is 40 minutes

3.7. Videos and Document upload procedure

Guidelines for uploading the videos for Hardware functionality demonstration, Rover functionality demonstration and design & test report will be provided shortly in the website.

4. SCORING CRITERIA

Rover functional demonstration evaluation criteria:

#	Evaluated Parameter	Max. Score
1	Compliance to the specifications	**mandatory**
2	Mobility on 0˚ slope	**10**
3	Mobility on 15˚ slope with a velocity in the range of 1cm/sec to 5cm/sec. The rover needs to be on the flat surface at the beginning of this activity and subsequently needs to climb the slope	**15**
4	Climbing 150 mm X 150 mm X 150 mm cube (obstacle) which is placed 1 m away from the starting point on a flat surface. The entire Rover needs to completely cross the obstacle.	**10**
5	Traversing through 200 mm diameter hemispherical crater which is created 1m away from the starting point which is on a flat surface. The entire rover needs to completely cross the crater.	**10**
6	Detection and avoidance of the craters and obstacles using sensors in loop: • The rover has to travel 1.5m by identifying and avoiding the obstacle of 300 mm X 300 mm X 300 mm dimension cube in real time without any human intervention. The obstacle will be placed at 0.5m from the starting point. Stopping mid-way or contact with the cube will attract penalty points. • The rover has to travel 1.5m by identifying and avoiding the 400 mm diameter hemispherical crater in real time without any human intervention. The obstacle will be situated at a distance of 0.5m from the starting point. Stopping mid-way or entry into the crater will attract penalty points.	**20**
7	Manipulator sample tube picking and placing demonstration – (weight & dimension of the sample tube shall be shown to be as specified in table 2) - The manipulator needs to pick the objectclear off the ground (contact with the ground shall be avoided once the sample is picked). The Rover then needs to travel 0.5m and place the sample tube on the ground.	**15**
8	Live telemetry feed demonstration – The rover needs to send the sensor data, live path planning data in graphical form or as coordinates back to the base station (eg., participant's laptop). The images of the obstacle, crater and sample shall also be sent to	**10**

	participants base station through RF link. This process shall be captured in the video for this particular task.	
9	Kill switch demonstration – While the rover is in motion, power cut-off to all the actuators on assertion of kill-switch shall be demonstrated	**10**
	Total:	**100**

Live video demonstration evaluation criteria:

#	Evaluated Parameter	Description of evaluated parameter
1	Rover measurements	Weight of the rover
		Length X Breadth X Height of the rover
2	Task completion (Segment-1)- Commanded Waypoint Navigation	Rover mobility to waypoint
		Obstacles detection and avoidance
		Rover traversing through ‘2’, ‘12’ and ‘4’ obstacles (refer to arena details)
		Rover following the commanded path
		Rover’s physical interaction with 300 mm cube and 400 mm diameter craters **(penalty)**
3	Task completion (Segment-2) - Autonomous Sample Pick Up	Identification of the sample
		Accuracy in sample picking (no. of the attempts taken to pick the sample)
		Crushing of the sample during pick-up **(penalty)**
4	Task completion (Segment-3) - Autonomous Navigation	Rover mobility to the sample drop position
		Rover’s physical interaction with 300 mm cube and 400 mm diameter craters **(penalty)**
		Sample dropped before reaching the sample drop location **(penalty)**
5	Task completion (Segment-4) - Autonomous Sample Drop	Identification of the container
		Accuracy in placing the sample in the container (no. of the attempts taken)
6	Task completion (Segment-5) - Autonomous Final Positioning	Accuracy of parking of the rover (Parked just outside the 1500 mm diameter circle which is centered at the sample drop point)
7	Live telemetry feed	Sensor data and live path planning graph etc
		Obstacle, Crater, Sample tube and Sample container detection images
8	Mode of operation	Switching from autonomous mode to commanded mode after segment-1 **(penalty)**
9	Optimization of resources and performance	Minimum mass, power and time taken (Relative scoring)

Annexure: General Rules and Regulations

The ISRO Robotics Challenge, URSC – 2024, referred to as 'IRoC-U 2024' is owned, coordinated, operated and judged by U R Rao Satellite Centre, Bengaluru. By taking part in the IRoC-U 2024, teams agree to place a promotional sticker on their rover (max. size of the sticker: 10 cm X 10 cm).

A1. Organisers' Disclaimer

Teams SHALL take full responsibility for any damages, accidents or unsettling events caused by their hardware/software as well as for the members of the team. Teams are obliged to follow all safety and good conduct rules specified by the organisers. Any breach of safety rules and requirements will result in the disqualification of the team from the entire competition.

A2. Changes to the Competition Rules

The organisers retain the right to effect any essential / inevitable changes to the competition rules. However, any changes introduced shall not impact the overall design of rover. All changes will be announced in advance and updated on the website.

A3. Deadline Extension

The organisers retain the right to extend the deadline for submission of documents. All deadline extensions will be announced in advance and details will be updated on the website.

A4. FAQ

The query raised by the teams will be updated on FAQ section of the website. Queries to any challenge related questions that arise should be mailed to contact mail ID from team lead's email ID with subject line FAQ. Teams are requested to check FAQ section before raising the query.

A5. Challenge Scoring Issues

All issues with scoring during the challenge will be resolved solely by the independent jury. Teams cannot appeal to any other party.

A6. Organisational Issues

Organisational issues, including team eligibility, conduct of challenge and execution of jury decisions will be resolved by the organisers.

A7. General Challenge Issues

In case any conflict related to the challenge is encountered, the organisers' decision will be considered as final and binding.

A8. Disqualification

The organisers may disqualify a team in the event of a serious breach of the rules, safety regulations or fair play and organisers' decision shall be considered as final and binding. Teams cannot appeal to any other party including social media platforms.

A9. Cancellation of Event

The organisers reserve the right to cancel the IRoC-U 2024 finals in the event of circumstances preventing its safe organisation. In case of event cancellation, the organisers will decide on the alternative approach and present it to the Teams affected by the decision.

A10. Organisers' Responsibility

The organisers' civil liability is limited solely to the responsibility for organising a mass event in accordance with the local law and local regulations.

A11. Copyright of the challenge

The organisers retain all copyright to the competition rules, logo, tagline and the description of the tasks. No alterations or additions to the competition rules can be made and their sale is expressly forbidden. The rules can only be used or copied for the IRoC-U 2024 connected activities (e.g. registration process).

A12. Personal Data Storage

Team members agree to their personal data, the documentation delivered as well as other promotional materials and visuals being stored and processed in the organiser's computer systems for the purpose of the IRoC-U 2024 programme.

On the other hand, the organiser will keep all technical documentation confidential and will not publish or disclose it to any third parties without prior approval from the team's representatives. The sole exception to this is the challenge's jury team – technical documentation will be disclosed to judges for scoring and mentoring purposes only.

The team members also give the organiser, parties designated by the organiser and the audience, the right to disclose and publish any photos, videos or other visuals, their names and surnames, identifiable pictures of themselves and any other persons, as well as pictures of machines, devices and equipment in any and all of the available formats, by any and every known method, in any and every known medium.

Teams grant permission to the organiser to use promotional materials and visuals (e.g. photos and videos), as well as any additional photos, videos, portraits, documents, interviews and other materials resulting from participation in the challenge (using the name of the participant or not) on all media, in any language, anywhere in the world, in any manner, for advertising and promotional purposes.

A13. Miscellaneous

- Individuals or teams may be excluded from participation at the discretion of URSC/ISRO for unauthorized behaviour, including but not limited to (i) impersonating a URSC/ISRO official whether intentionally or in a manner that results in confusion, (ii) misuse of the logos or identifiers of URSC/ISRO, any sponsoring organisation, or any infringement of a commercial logo or trademark, (iii) failure to abide by competition rules, directives or instructions from the competition host or organisers, and (iv) asserting or implying a URSC/ISRO affiliation or sponsorship where none exists.
- URSC/ISRO does not host pre-competitions or competitions conducted by any organisation other than URSC. This URSC competition is neither affiliated with, nor sponsors or endorses any Rover Challenge competition other than the IRoC-U 2024. Outside competitions have no bearing on the IRoC-U 2024 qualification or registration process, and representation to the contrary is strictly prohibited. No competition may imply any affiliation with URSC/ISRO or use the URSC/ISRO logo without permission of URSC/ISRO Headquarters. Any assertions made by organisations that represent themselves as "URSC/ISRO", "Official URSC/ISRO Rover Ambassador", "URSC/ISRO Judge", or any similar titles suggesting a tie to URSC/ISRO are unauthorized. Representations or suggestions that any organisation or individual can assure teams of being accepted for registration or participation in the challenge are unauthorized. All requirements for participation in the IRoC-U 2024 are outlined in this rules book.
- Participant hereby waives any claims against URSC/ISRO, its employees, its related entities, (including, but not limited to, contractors and subcontractors at any tier, grantees, investigators, volunteers, customers, users, and their contractors and subcontractors, at any tier) and employees of URSC/ISRO's related entities for any injury, death, or property damage/loss arising from or related to the IRoC-U 2024, whether such injury, death, or property damage/loss arises through negligence or otherwise, except in the case of wilful misconduct. Any team member or advisor found to be exhibiting unsportsmanlike conduct may be disqualified from the challenge individually or as a team. All scoring decisions are final. If an appeal is warranted, the advisor or the team leader shall submit the appeal in writing for consideration to the Activity Lead within 30 minutes of the posting of score(s) in question. The final decision of the Activity Lead and Head Judges shall prevail.
- Students on the team will do 100% of the project, including design, construction of their vehicle and task components (including performing work that is supported by a professional machinist for the purpose of training or safety), written reports, presentations, and competition preparation. Any team found in violation of this will be disqualified. Excessive use of past work will result in disqualification, but teams may use vehicles designed in 2020-2023.
- Teams not meeting any requirement listed may be disqualified.

IRoC-U 2024

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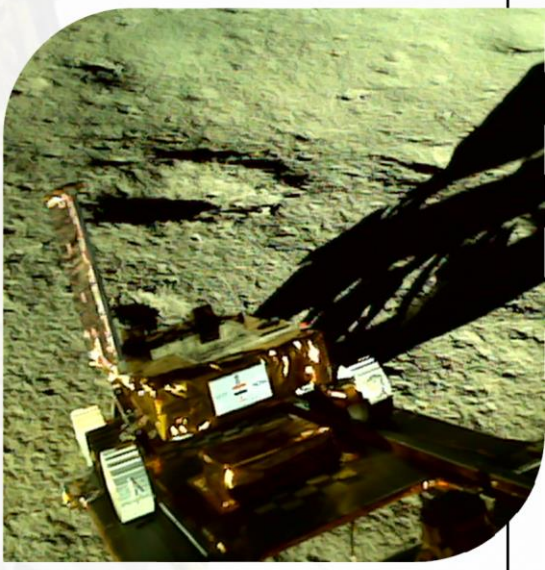

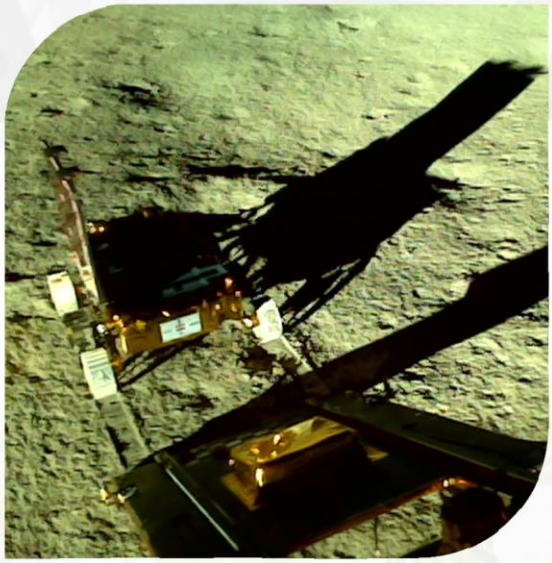

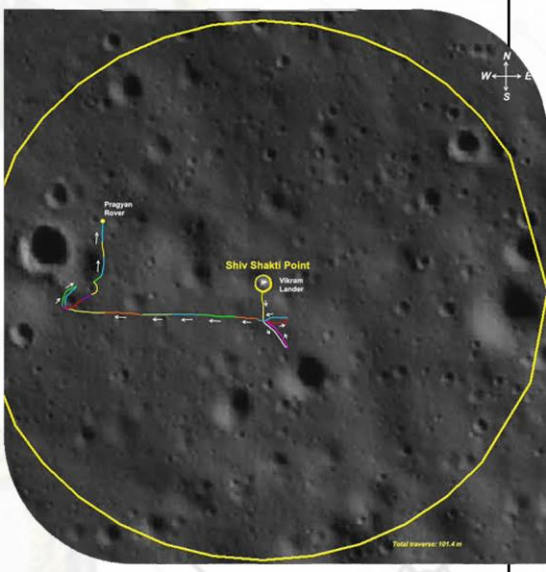

Reach us at:

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