NATIONAL AERO-GENIUS COMPETITION (NAGC) - 2026

Space Robotics Challenges

Competition Rules and Requirements

Organized by

Faculty of Aerospace Engineering and Technology (FAET)
Aviation and Aerospace University, Bangladesh (AAUB)

Competition Date: 30-31 October 2026 | Venue: AAUB Campus, Lalmonirhat, Bangladesh
Registration Link: https://event.aaub.edu.bd

Introduction

The **National Aero-Genius Competition (NAGC)-2026** is the first-of-its-kind event in Bangladesh, organized by and hosted at the campus of **Aviation and Aerospace University, Bangladesh**. Teams from various universities/institutes/affiliated colleges of Bangladesh are expected to participate in the **National Aero-Genius Competition**, showcasing their projects implemented based on hands-on skills and problem-solving capabilities.

The contest will provide engineering students with a real-world Space Robot (Rover) design experience by allowing them to validate their analytical skill and design concept. Student teams will design and demonstrate the mission performance capabilities of their designed and built, remote-controlled AUTONOMOUS Rover that can best meet the specified mission profiles.

NOTE: Items critical to safety and rule compliance are mentioned throughout this document. It is the responsibility of all teams to know and follow all provided rules and all mission briefings.

Participating teams will be evaluated on three equally important pillars: their written Technical Design Report, successful passage of a rigorous Technical Inspection, and on-ground performance of the **Rover** in each mission during the competition. The team achieving the highest overall score will be declared the winner.

This rule book will provide all the guidelines for this competition.

Table of Contents

1. General Information

1.1 Requirements for Participation

1.1.1 Affiliation

- Participants can be students of universities or affiliated college/institutes of any university as well as hobbyists in the field of Space Robotics.

1.1.2 Team Composition

- Teams shall consist of maximum eight (8) participants.
- A team may include a maximum of two graduate students (considered within the team composition) graduated from the same university/institute no more than two academic years before June 30, 2026.
- Teams may have one faculty advisor and one mentor (not considered within the team composition).
- Teams must be formed with participants from the same university/institute/college.
- Teams must designate a **Team Leader** who will be the primary point of contact and select a unique team name.

1.1.3 Number of Teams

There is no limit to the number of Space Rover teams participating from a single university/institution. However, one participant cannot be a part of multiple teams.

1.2 General rules

- The competition will consist of the following rounds:
  - (i) Design Report Submission
  - (ii) Technical Inspection Round &
  - (iii) On-ground mission competition Round.
- Each team must showcase their device (along with oral technical overview) for ratification prior to the commencement of the competition. Teams are prohibited from making any modifications to the code or model/design of the Space Rover after showcasing, except for software-related adjustments.
- Judges may request explanations regarding any mechanisms of the Space Rover and reserve the right to inspect the code/software/device if deemed necessary.
- The decisions made by the judges will be final and binding. No objections or appeals will be entertained regarding their decisions.
- Each team is responsible for bringing its own supporting equipment, such as laptops, batteries, chargers, converters, multi-plugs, and other necessary tools.
- Participating teams are solely responsible for the safety of their devices. Teams will be held accountable for any incidents or damage caused by their Space Rover or team members.
- The organizers reserve the right to amend or modify the competition rules as they see fit.
- Trial run/navigation of the Rover on the competition track/ground/terrain is strictly prohibited.
- The Rover may not cross predefined safety boundaries, and the operator shall remain in the designated **Operation Enclosure.**
- The organizers' official time recording stands as the definitive measure for scoring of the teams.

1.3 Sportsmanship and Code of Conduct

All teams and participants are expected to uphold the highest standards of sportsmanship during the competition. Attempts to intentionally violate the rules or negatively impact the performance of other teams will not be tolerated. Penalties for violations will be decided by the Contest Administration and may range from a warning and loss of a mission score to full disqualification from the current and future competitions.

- Displays of disrespect toward judges, volunteers, security personnel, or opposing teams will lead to disqualification.
- Threats, misbehavior, or any actions intended to create disturbances or conspiracies will result in immediate disqualification.
- Teams failing to arrive at the venue within the designated time slot will be disqualified.
- Any damage caused to AAUB's arena infrastructure or equipment by a team's Rover may result in immediate disqualification and financial liability.

2. Schedule and Registration Information

Teams those will be **selected for the final field competition** after the Design Report submission and evaluation will be required to pay the very **nominal registration fee as set and circulated by the organizing committee as per schedule below:**

Item	Date / Requirement
Pre-registration Deadline	01 August 2026
Technical Report Submission Deadline	01 October 2026
Notification of Technical Report Result	10 October 2026
Registration Deadline	15 October 2026
Registration Fee	BDT 1000 per selected team for the field missions

3. Design Report & Submission Method

Each team must prepare Critical Design Report (CDR) of its Rover in pdf format. Formatting and submission procedure:

- Each team will submit the CDR in not more than **5 pages** within 01 October 2026.
- Electronic report files must be named: "2026_AeroGenius_Space Robotics [Team name] [Institution Name].pdf.
- **The CDR Submission Link:** https://event.aaub.edu.bd / aerospacedept@aaub.edu.bd (The email Subject will be 'National AeroGenius Competition_Space Robotics 2026')

Report Format

Reports are limited to 5 pages of text and graphics (images, figures, etc.). A cover page is optional and is not included in the 5-page limit, but may only include the report title, team name, university, country, and contact information (student team leads and an optional point of contact). If not included on a cover page, this information must appear in a header at the top of the first page. Pages should be in letter paper size (8.5 in. x 11 in.), with margins no smaller than 1 in. (2.5 cm), text in Calibri 11-point font

(or similarly sized font), and single-spaced. Electronic submissions are required in *.pdf file format only. All text embedded in figures must be easily legible when zoomed to 250%.

- **Pages 1-4** may include text and graphics (images, figures, etc.).
- **Page 5** may only include the Science Plan.

Judges will not consider any content after the end of the fifth page (not including the cover page), regardless of the situation or content remaining on additional pages.

Unless provided for citation, links to external files should not be provided. Judges will not consider any information from teams beyond the report and video limits specified here.

Report Contents and Criteria

System Overview & Architecture (30%) Describe your team's system, presenting the overall system architecture, and discussing critical subsystems (to include communication and command and control subsystems). Teams should provide a system-level context that describes the overall design and demonstrates a thoughtful system engineering approach. Describe in detail the subsystems that are considered particularly novel. System architecture diagrams are required. Teams must discuss (and clearly communicate through a system architecture diagram) which subsystems are new for this competition cycle and which have been reused or modified from prior to September 1, 2025.

Detailed scoring criteria:

- Description of System (8%)
- System Architecture Diagram(s) (8%)
- Description of subsystems which are new versus reused or modified (7%)
- Detailed description of new and novel features (7%)

Integration and Testing (18%) Describe your team's integration plan in a way that is consistent with your system architecture description, and articulate your current integration status. Describe your team's test plan, addressing how the team will conduct testing at the component/subsystem level, system level, and operational testing/training. Description of software testing is encouraged. If a team is using any modeling and simulation tools, they should be described in this section.

Detailed scoring criteria:

- Approach to Integration (8%)
- Status of Integration (5%)
- Test Plan (5%)

Project Management (12%) Describe your team's organizational structure and how project management is being executed through the second half of the competition cycle (January - May). Describe team training (mentorship and education within the team, in particular training related to integration, testing, and operations), and educational and public outreach activities.

Detailed Scoring Criteria:

- Team Organization (6%)
- Approach to Team Training (3%)
- Educational and Public Outreach (3%)

Science Plan (40%; page 5 only) The Science Plan should describe the experiments designed to take place on board the rover, including the sample cache system and the on-board instrument(s)/method(s) of the team's choice.

4. Requirements and Guidelines

4. **Competition Missions.** There will be four (04) missions (challenges) upon which the Rover Team's performance will be evaluated. **The Missions (Challenges) are: (1) Science Mission; (2) Delivery Mission; (3) Equipment Servicing Mission and (4) Autonomous Navigation Mission.**

General Rules and Guidelines

4.a. The rover performance shall be judged in the four (04) competition missions outlined below, and also on the judges' observation.

4.a.(i). From the time teams are given access to their command and control to the corresponding station, teams will be able to set up all necessary systems, including all communications systems, and be ready to compete in no more than 20 minutes. Teams shall be able to remove all equipment in no more than 15 minutes at the end of the mission, and will be asked to switch off radio equipment immediately.

4.a.(ii). Teams are not required to return the rover to the start gate or collect any deployed items (e.g., radio repeaters, cameras, tools) before the end of any mission. However, the rover and all deployed items must be returned or collected within 10 minutes after the completion of the mission.

4.a.(iii). For the four competition events, the rover is not required to be in the same configuration so modular pieces can be swapped between missions. On days that teams compete in the Science and Delivery Missions, teams will only compete in one Mission. Teams may be required to begin the Autonomous Navigation Mission soon after 10 minutes of the completion of the Equipment Servicing Mission, operating from the same corresponding station on an adjacent course.

4.a.(iv). The rover will be accessible throughout the competition, and modifications can be made at any point.

5. Science Mission

5.a.(i). The goal is to collect sample(s) chosen by the team at site(s) selected in the field, perform basic science evaluation of these samples with onboard instrumentation, and store at least one sample as a cache. Sites shall be analyzed for their likelihood to support microbial life with at least one life detection method. The team should evaluate at least two sites and acquire samples from one site to use as the returned cache.

5.a.(ii). Teams will be given between 20 and 30 minutes to collect and analyze data with the rover, and may visit as many sites as time allows. Through the information relayed by the rover, teams shall select sites of potential biological interest within a 0.5 km radius of the corresponding station. Samples must be analyzed by the rover on-site and may not be brought back to the team for investigation or laboratory analysis.

5.a.(iii). Teams shall document each site investigated by:

- **A wide-angle panorama showing the full context of the site. The panorama must indicate cardinal directions and have some indication of scale.**
- **A close-up, well-focused, high-resolution picture with some indication of scale at the sampling site.**
- **A photo of a stratigraphic profile of a nearby hillside using the on-board cameras to determine the depositional environment and history of water in the sedimentary structures**

visible at the size.

- **GNSS coordinates of each site, to include elevation and accuracy range.**

5.a.(iv). Onboard equipment at a minimum should include: A life detection capability, and a second science capability of the team's choice to accomplish the task goals (a second life detection capability would be permissible). Any chemicals used onboard, including water and any reaction products, must follow a no-spill policy of being contained on the rover and not spilled on the ground.

5.a.(v). Based upon investigation of at least two sites, teams shall then collect a sub-surface sample from one of the sites at a depth of 10 cm or deeper. Sample(s) must be at least 5g and may consist of a single rock, loose soil, or anything in between. The portion of the sample from below 10 cm will be used to determine the sample mass. After collection of the sample, the rover must then store and close/seal it in a cache container onboard the rover, and return the sealed cache to the corresponding station. Sealed cache must prevent sample from spilling if laid on its side or upside down. Cache must be removable from rover within 5 minutes after end of roving time. Team members must remove cache and hand it to the judges.

5.a.(vi). After giving the cached sample to the judges, teams will have a debrief and discussion with the judges. The score for this task will be based on the following components: Thoroughness of the investigation of sites (panoramas, site selection, stratigraphic profile); Quality and applicability of the onboard analysis (life detection, science capabilities of choice); Quality of the sample returned (weight, depth, possible contamination); Scientific knowledge of astrobiology.

6. Delivery Mission

6.a.(i). The objective of the Delivery Mission is to evaluate the rover's capability to locate, identify, retrieve, transport, and accurately deliver mission-critical payloads within a simulated planetary exploration environment. Total mission duration shall be 30 minutes.

6.a.(ii). The mission shall be conducted in stages with progressively increasing operational complexity.

4.1.1 **Basic Delivery Operation:** Locate the assigned payload, retrieve the payload, and transport the payload to the designated delivery zone (1 point per 1 kg of excess weight).

4.1.2 **Retrieval and Delivery Operation:** Locate a storage container or toolbox, open the container, retrieve the assigned payload, and deliver the payload to the designated target area. (Bonus marks if completed circular path properly).

4.1.3 **Advanced Delivery Operation:** Identify the correct payload based on mission instructions, retrieve the required payload, and deliver the payload to the correct destination. (Bonus mark if GUI works properly).

6.a.(iii). The competition arena shall simulate a planetary surface environment and may contain: compact soil surfaces, sand patches, gravel sections, artificial rock fields, inclined ramps, uneven terrain, and obstacle zones. The difficulty of the terrain shall increase progressively throughout the mission.

6.a.(iv). Mission payloads may include scientific instruments, maintenance tools, supply containers, emergency support kits, and artificial rock samples. Maximum weight is 5 kg (Extra highest 10kg for extra points). Maximum dimensions: 40 cm × 40 cm × 40 cm. All payloads shall include at least one graspable feature suitable for robotic manipulation.

6.a.(v). Delivery Tasks may include: Standard Payload Delivery; Storage Box Retrieval Task (opening a toolbox lid); Astronaut Support Delivery Task (delivering an oxygen kit, medical package, etc.); Search and Deliver Task; Color-Coded Delivery Task (matching payload to delivery zone); Instruction-Based Delivery Task (using QR codes or visual signs); Precision Placement Task (10 cm, 20 cm, or 30 cm scoring circles); and Fragile Payload Transport Task.

6.a.(vi). Penalties may be applied for delivering the wrong payload, delivering to the wrong destination, payload drops, damaging mission elements, exceeding boundaries, or unsafe rover operation. Autonomous capabilities are encouraged and additional points may be awarded for autonomous navigation and precision placement.

7. Equipment Servicing Mission

7.e.(i). The Equipment Servicing Mission evaluates the rover's capacity to perform autonomous and teleoperated dexterous maintenance tasks within a highly constrained environment. Teams are allocated a maximum operational window of 30 minutes to complete the mission.

7.e.(ii). The Operational Boundary: "The Dead Zone." All primary servicing tasks must be executed within a strictly defined geographical boundary designated as the "Dead Zone." The Dead Zone is characterized as a rough, flat ground surface with a strictly enforced diameter of 25 meters. The rover must navigate up to 100 meters across relatively flat but rocky terrain from the starting gate to successfully reach the Dead Zone. The entirety of the servicing mission must be completed within the confines of the Dead Zone.

7.e.(iii). Mission Penalties: Traversal Failure (if the rover fails to successfully reach and cross into the Dead Zone, the team will be assessed a 20-mark penalty). Boundary Violation (once the mission commences inside the Dead Zone, any breach of the perimeter will incur a 10-mark penalty per instance).

7.e.(iv). Task 1: Field Operations [70 Marks Maximum]. The rover must utilize its manipulator assembly to interact with various physical interfaces:

- **Sample Stowage:** Open a designated containment drawer, insert a test-tube-sized sample tube, fully close the drawer, and successfully engage the mechanical lock.
- **Surface Painting:** Retrieve a provided painter's brush and apply paint to a designated color board.
- **Data Cable Connection:** Insert a USB Type-C cable into the corresponding Type-C port of a mobile device.
- **Hose Routing:** Push a flexible hose pipe entirely through a provided structural opening measuring approximately 4 cm in diameter.
- **Valve Actuation:** Actuate a ¼-turn lever valve handle, pulling it downward to rest on the horizontal axis (mounted >1.5 meters above ground level).
- **Interface Manipulation:** Interact with a multi-element control panel by pressing momentary push buttons, flipping industrial switches, and successfully plugging a standard mobile charger into a power receptacle.

7.e.(v). Task 2: Manual Typing [30 Marks Maximum]. Team operators will be issued a 6- to 8-letter launch key before the commencement of the mission, which they may pre-program or can be typed manually through vision on a vertically mounted mechanical keyboard. Standard 4 x 4 cm ArUco fiducial markers will be affixed directly to the outer corners of the keyboard frame to facilitate machine vision. There will be a 2-mark penalty to correct spelling errors utilizing the backspace/delete keys. Teams are allowed to type autonomously, but it is not the major requirement.

8. Autonomous Navigation Mission

8.f.(i). The Autonomous Navigation Mission evaluates the rover's ability to operate entirely without human teleoperation across a defined outdoor course. The total mission time limit is 20 minutes for a maximum of 100 marks. The competition field is an outdoor terrain course covering approximately 200 m × 200 m. The Base Station is a marked 2 m × 2 m zone.

8.f.(ii). Phase 1: Departure, Obstacle Avoidance & Tree Vitality Detection:

The rover must autonomously depart the Base Station upon receiving a single start signal. Between the Base Station and GPS Point 1, the rover must detect and navigate around all obstacles without physical contact. The rover must navigate to within 1.5 m of GPS Point 1. At GPS Point 1, the rover must autonomously determine whether a designated tree is alive or dead using its onboard sensors (visual, moisture, multispectral, or thermal) and log its verdict.

8.f.(iii). Phase 2: Navigation to GPS Point 2 & Panoramic Imaging:

The rover must autonomously navigate to GPS Point 2 (within 1.5 m) and capture a 360° panoramic image of its surroundings using its onboard camera system. Minimum resolution is 1920 × 1080 px, correctly oriented (horizon level within ±5°), with no severe motion blur.

8.f.(iv). Phase 3: Return to Base Station & Bonus:

The rover must autonomously navigate back to the Base Station and stop within the 2 m × 2 m zone. Bonus points will be distributed according to the mission completion time, with higher bonuses awarded for completing the mission within shorter time thresholds (15,18,and20 minutes).

8.f.(v). The rover must operate in fully autonomous mode for the entire mission duration after the start signal. Pre-loading of GPS coordinates before the run is permitted. No wireless data link to a remote computer for real-time decision-making is allowed. All processing must be onboard. Maximum rover speed is 1.5 m/s on the course. A hardware kill-switch must always be accessible and functional.

8.f.(vi). Within 10 minutes of run completion, teams must submit: the Tree Detection Verdict log file, the Full 360° Panoramic Image file, and the Onboard Run Log (GPS path, timestamps, obstacle detection events). Failure to submit within the window results in forfeiture of marks for the corresponding task.

9. Competition Rules

9.a. Operations

9.a.(i). Teams will operate their rovers in real-time from designated corresponding stations. Visibility of the course to the operators in the station will be completely blocked. Basic power, tables, and chairs will be provided. All of the competition events will be held in full daylight.

9.a.(ii). There should be line-of-sight radio communication from the station to the rover for the Science, Equipment Servicing, and Autonomous Navigation Missions. For the Delivery Mission,

line-of-sight communication is not guaranteed for more than 50% of the course. Rovers are not expected to travel more than 500m from the corresponding station.

9.a.(iii). Wind may frequently whip up dust. Rovers shall be able to withstand these conditions and also light rain, but will not be expected to compete in heavy rain or thunderstorms.

9.a.(iv). Testing will not be allowed at the competition site before, during, or after the event except in specifically designated locations.

9.a.(v). The Global Navigation Satellite System (GNSS) standard shall be the WGS 84 datum. Coordinates will be provided in latitude/longitude format.

10. Team Members

10.b.(i). Team Composition

1. Teams shall consist of maximum eight (8) participants.
2. A team may include a maximum of two graduate students (considered within the team composition) graduated from the same university/institute no more than two academic years before June 30, 2026.
3. Teams may have one faculty advisor and one mentor (not considered within the team composition).
4. Teams must be formed with participants from the same university/institute/college.
5. Teams must designate a **Team Leader** who will be the primary point of contact and select a unique team name.

10.b.(ii). Teams are encouraged to work with advisors. Advisor should limit their involvement to academic-level advising only. Advisor can spectate from the field, but may not spectate from within the station.

10.b.(iii). All team members operating the rover must remain in the designated operators' area (Station). Nobody may follow alongside the rover for the purpose of providing feedback to the operators. Members following the rover may participate as runners or activate an emergency kill switch, but may not otherwise participate in that mission.

10.b.(iv). It is incumbent upon the student team leaders to ensure that their respective teams uphold the integrity of this competition.

11. Rover Design and Manufacture Rules

11.a. Size, Weight and Power

11.a.(i). The rover shall be a stand-alone, off-the-grid, mobile platform. Tethered power and communications are not allowed to the station, but are allowed between the rover and any deployable items.

11.a.(ii). Rovers shall be weighed by the judges during the set-up time of each mission. For weighing the rover must fit completely within a 1.2 m × 1.2 m × 1.2 m box. Rovers may articulate/fold to fit within the crate, but may not be disassembled to do so. Failure to fit will result in a 40% penalty.

11.a.(iii). The maximum allowable mass of the rover when deployed for any competition mission is 50 kg. The total mass of all fielded rover parts for all events is 70 kg. For each event in which the rover is overweight, the team shall be assessed a penalty of 5% of the points scored, per kilogram over 50.

11.a.(iv). Rovers shall utilize power and propulsion systems that are applicable to operations on Mars. Air-breathing combustion systems are not permitted.

11.a.(v). All rovers shall have a red push-button emergency stop that is readily visible and accessible on the exterior of the rover. This push button shall immediately stop the rover's movement and cease all power draw.

11.a.(vi). Any mobile deployable, such as a mini-rover, requires its own E-stop.

11.b. Communication Equipment for Autonomous movement and navigation of the Rover

11.b.(i). The rover shall be operated remotely using wireless communications with no time delay. The operators will not be able to directly view the rover or the site.

11.b.(ii). Wireless communication methods used by teams shall adhere to all applicable for the Bangladesh standards.

11.b.(iii). Both omnidirectional and directional antennae are allowed. Steered directional antennae may use a mechanized antenna controlled via an electronic signal, but it is not allowed to mount a camera on top of the antenna for visual feedback.

11.b.(iv). Base station antenna height is limited to 3 m. Antenna bases must be located within 5 meters of the team's corresponding station.

11.b.(v). Restrictions on the 900 MHz band (902-928 MHz): Teams shall not use frequency bandwidths greater than 8 MHz. Teams must also be able to operate exclusively within each of the following three sub-bands: "900-Low" (902-910 MHz), "900-Mid" (911-919 MHz), and "900-High" (920-928 MHz). On the mission schedule, the team will notify teams which sub-band may be used.

11.b.(vi). No restrictions on the 2.4 GHz and 5 GHz bands. Frequency restrictions in these bands have been removed. Within the 2.4 GHz and 5 GHz bands, teams may use the maximum potential of their bands. Teams must expect to be operating within proximity of other teams and be able to deal with any potential interference.

11.c. Interventions

If a rover or other deployable suffers a critical problem during a mission that requires direct team intervention (anything requiring touching of the devices in the field), that intervention shall be subject to the following:

11.c.(i). A request for an intervention can only come from the team members operating the devices, not any team members spectating in the field. They may designate any number of team members who may go to repair or retrieve the device **("runners").**

11.c.(ii). If a spectating team member intervenes without request from the operators, it counts as an emergency stop. The current mission will be considered terminated, although the rover may compete in subsequent missions.

11.c.(iii). If a team member leaves the station to become a runner, they will not be permitted to return to the station to participate in operating the mission.

11.c.(iv). Runners may fix the device in the field without moving it, return it to the station, or return it to the start of that obstacle/task.

11.c.(v). If the device is returned to the station, the operators may take part in the diagnostic and repair process, but runners and spectators may not communicate any details about the mission site to the operators.

11.c.(vi). During an intervention, the team members in the field may communicate directly with the operators in the station to facilitate repairs.

11.c.(vii). If an intervention is required on the rover during the mission, teams may continue the mission after completing the necessary intervention. Swapping the rover battery shall also be considered an intervention.

11.c.(viii). Teams will be penalized 20% of the total points in that mission for every intervention. The mission clock will continue to run during an intervention. Multiple intervention penalties in a single mission are additive.

12. Conclusion

The National Aero-Genius Competition (NAGC) 2026 – Space Robotics Challenge provides a unique platform for students and robotics enthusiasts across Bangladesh to demonstrate their innovation, engineering skills, and problem-solving capabilities through the design and operation of advanced rover systems. By integrating technical design evaluation, rigorous inspection, and mission-based field performance, the competition aims to promote hands-on learning and foster excellence in space robotics. Participants are encouraged to adhere to all rules, maintain the highest standards of professionalism and sportsmanship, and showcase creative solutions that advance the future of autonomous exploration technologies.

13. Contact Information:

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