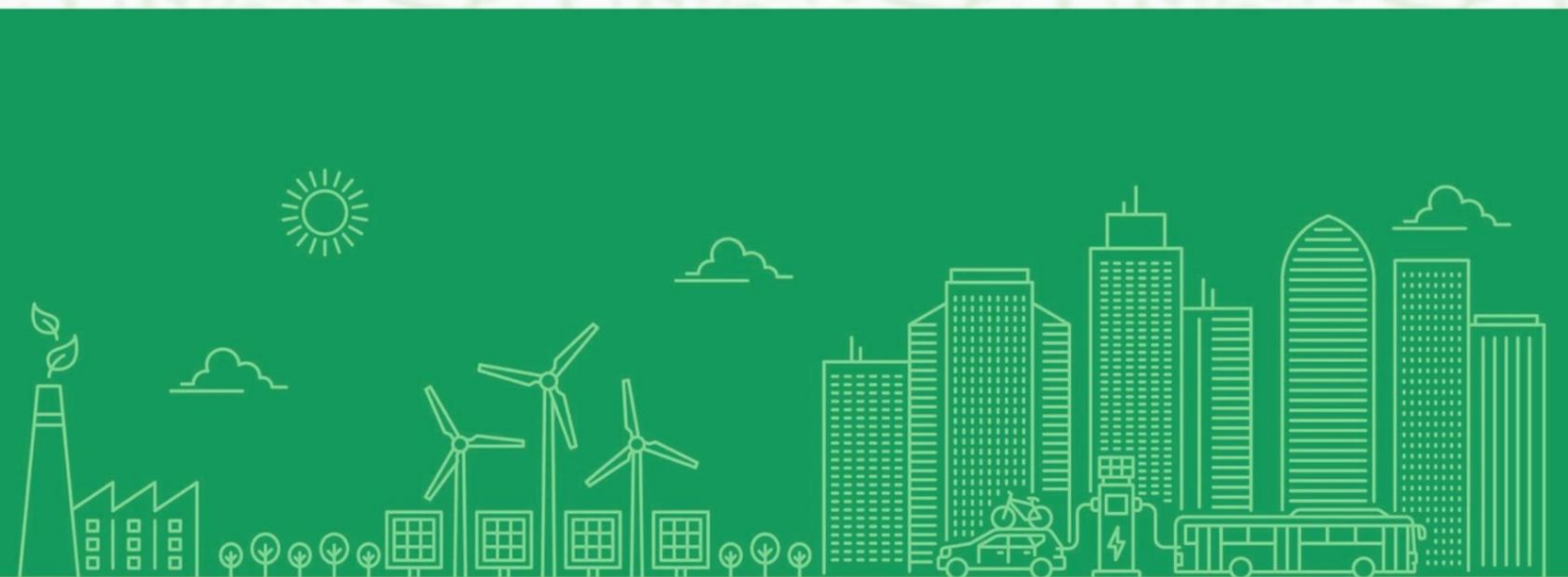


CubeSat

CATEGORY

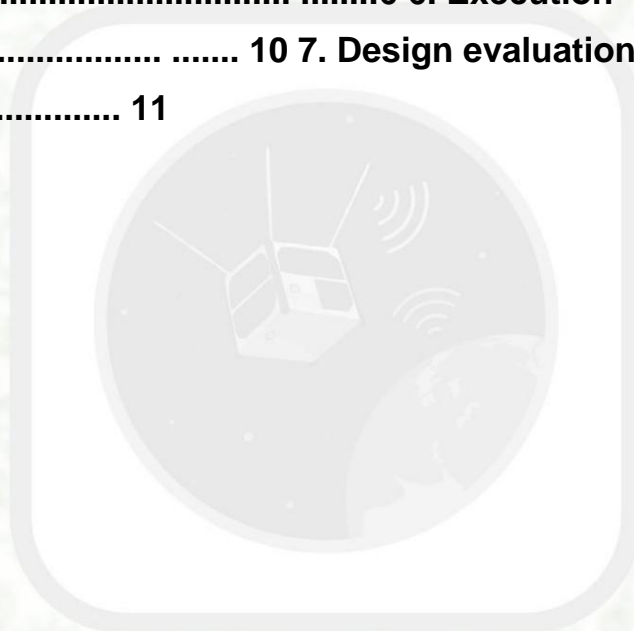


RULES OF THE FINAL STAGE

BAKU 2024

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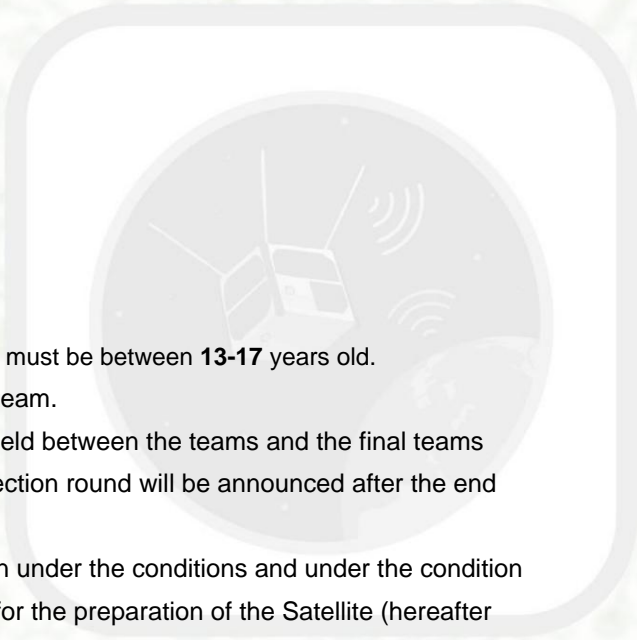
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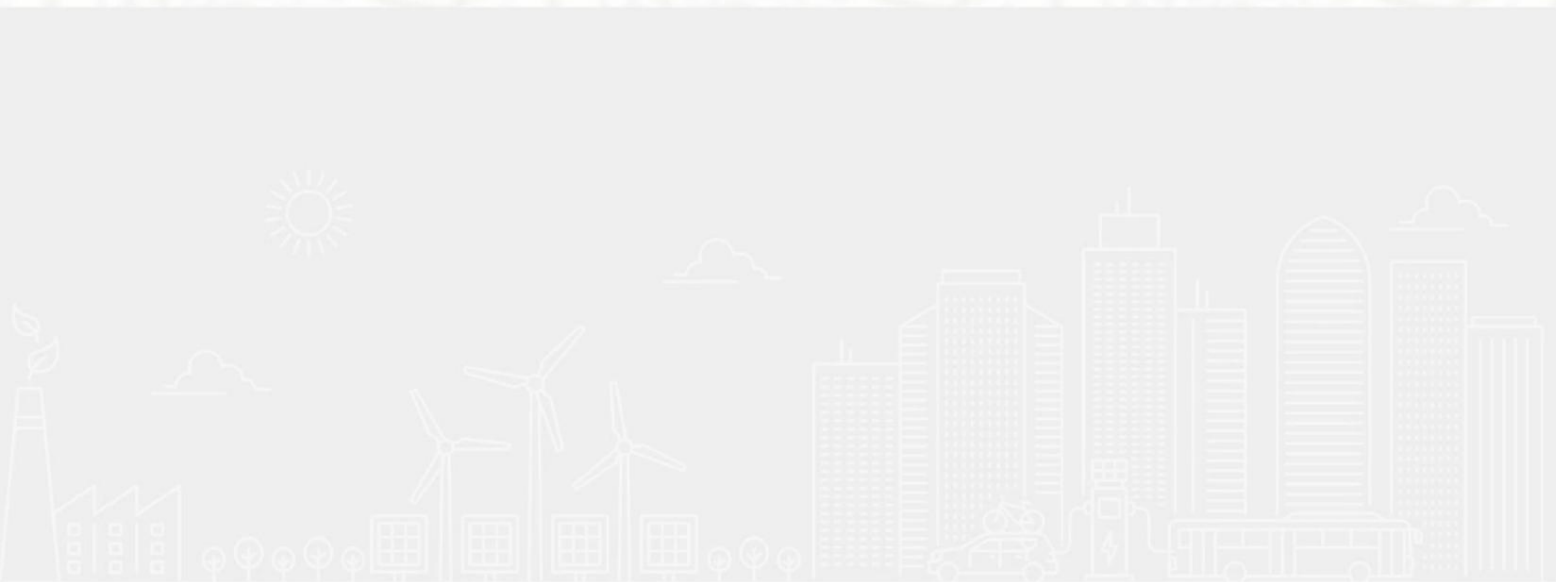


1. Introduction

The CubeSat competition encourages youth and technology enthusiasts to learn STEAM skills and use, experiment with sky technology, explore the working principles of future technology, engineering, design practices and independent thinking encourages to achieve the result by developing the ability. The goal is to gather knowledge, learn to collaborate, compete, and have fun at the same time.

2. Teams

- 
- 2.1.** Teams should consist of 3 people (1 team leader, 2 person student).
 - 2.2.** The team leader must be over 18 years old, and the students must be between **13-17** years old.
 - 2.3.** Each team leader and student can participate in only one team.
 - 2.4.** After the end of the registration, a selection round will be held between the teams and the final teams will be determined. The conditions and time of the selection round will be announced after the end of registration.
 - 2.5.** Anyone who wants to participate in the competition can join under the conditions and under the condition that they do not deviate from the equipment specified for the preparation of the Satellite (hereafter Sat).



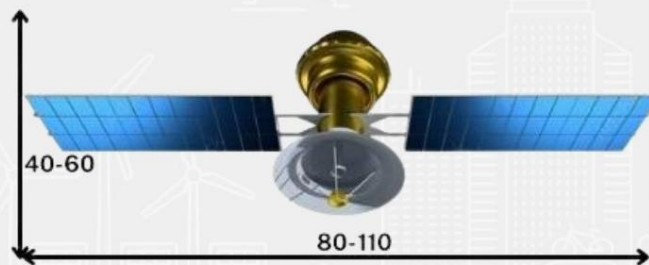
3. Description of the competition

3.1. The competition consists of two parts. In the first part, each team's CubeSat with the presentation of the design and technology of the carrier satellite it will be located on will be evaluated. You can use this QR link for examples:



Figure 1. Carrier satellite model (example)

3.2. The size range given here for the model should be in the range of length 80-110cm, width 40-60cm, height 40-60cm with wings and external devices opened.



3.3. The satellite model should consist of 3 parts:

3.4. Body - body part should be gold or aluminum colors. Body

There should be a separate place for placement of CubeSat.

3.5. Wings – Solar panels should be visible. Both real and here decorative photo paper panels can be used.

3.6. Antenna- At least 1 and maximum 3 antenna models on each model should be

3.7. Note: 1 piece of support from the central part during the presentation of the prepared model should be placed on it.

3.8. In the second phase, each CubeSat (hereafter Sat) will be lifted up to 6 meters by carrier helium balloons provided by us. Each team must then establish a wireless connection and send the following information:

- Air temperature, • Air moisture value,
- Gyroscope (tilt angles along the X, Y and Z axes)
- GPS coordinates • One photo image

3.9. Attached to the carrier helium balloon, the Sat will be launched first with the launch whistle. After the whistle, the team must attempt to communicate with their Cubesat. This time will be recorded when the connection is connected and will be written to the account of the team. After sending the data will be brought down by the judge.

3.10. Sat, which was damaged during landing, resolved the problems until the next attempt can raise

3.11. The team will be given 2 minutes to complete all these tasks.

3.12. The task will be considered incomplete for Sat that does not land within 2 minutes.

3.13. Each team will be given 3 attempts and according to the task given in each attempt will be assessed individually.

3.14. If the team has completed 2 tasks in the 1st attempt and in the following attempts When other tasks are completed, the points collected by the team will be collected.

3.15. The team's task completion time will be taken as the average of the total of 3 attempts.

4. Structure of the competition

4.1. During the competition, the evaluation will be conducted by Azerkosmos employees.



4.2. The dimensions of the Sat to be prepared should be **10x10x10cm**. Sizes smaller or larger than these sizes **are not allowed to compete!**

4.3. The floor of the competition area will be 6x6 meters with tatami

4.4. Carrier helium balloons will be provided by us at the competition area.

4.5. In case of technical problems that occur during the race without the responsibility of the team, the race is stopped and the race is continued after the technical problem is resolved.

4.6. In the competition, **2** minutes are given for renting tasks

4.7. Outside the red tape after the teams have placed their Sats on the carrier they should stop.

4.8. The data will be checked against real-time values at the time of data visualization.

4.9. If any team sends default values with a ready-made template, that team will be disqualified.

4.10. Each team's Sat must send data with **at least 1 sensor** and to the ground should come down.

4.11. If Sat connection is lost during landing, the race is stopped **4.12.**

Using 433Mhz, IP, WiFi, SMS and bluetooth connection for wireless communication should be.

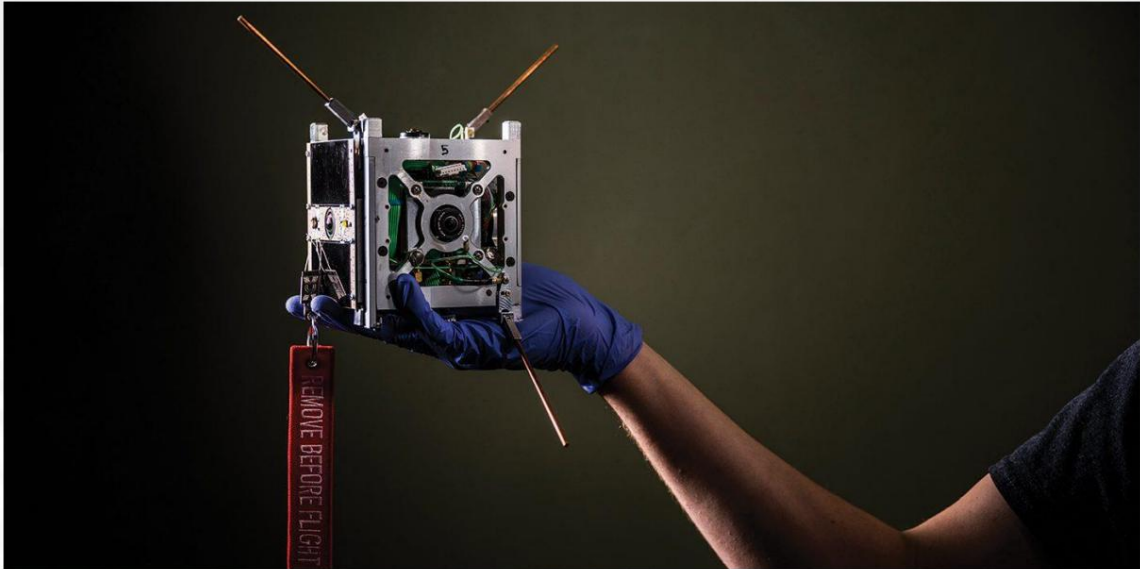
5. Items required for CubeSat preparation

5.1. **Body-** Can be made from wood and plastic materials using 3D printer or laser cutting with **10x10x10cm** edge points .

5.2. For the international standard of measurements for CubeSat, it should be done from this link. use

https://upload.wikimedia.org/wikipedia/commons/3/33/CubeSat_Design_Specification_rev._12_-_1U_dimensions.png

5.3. At least 1 part of the body must be open so that the inside can be seen. Body part should be attached to the team's satellite model.



5.4. Weight- the movement of the prepared Sat with the helium balloon should be taken into account. You are the reason maximum weight should be **400 grams** .

5.5. There is no limit to the applications used for wireless communication. Recommended software is BLYNK software. <https://blynk.io/home-new>



5.6. When sending information by SMS, to the address that the judge will inform during the competition and or should be sent to a mobile number. SIM800 module should be used for SMS communication.



5.7. Arduino nano(or uno) and ESP for counting operations modules should be used.



5.8. Arduino nano



Arduino UNO

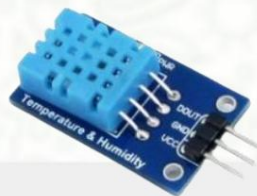


ESP32 or ESP8266

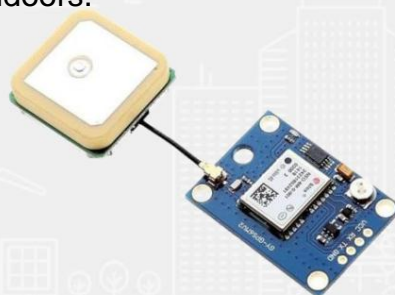
5.9. ESP32- for taking or sending photos, which is the main part of the task
The CAM module must be used.



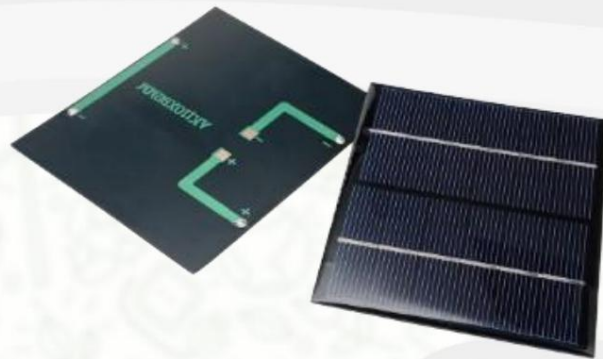
5.10. Using DHT11(or 22) sensor for temperature or humidity values
should be. In addition, the use of a sensor other than this sensor
is allowed.



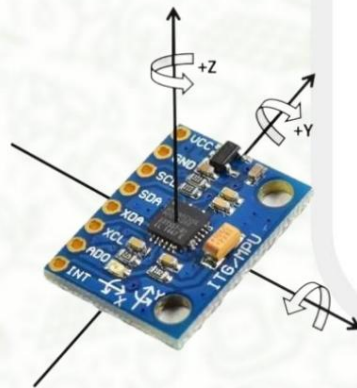
5.11. The most important data information of the objects in the sky are their coordinates
in the air. NEO-6M GPS module can be used for this.
But other modules are also allowed. Calculation of these data will not be
necessary if the race is indoors.



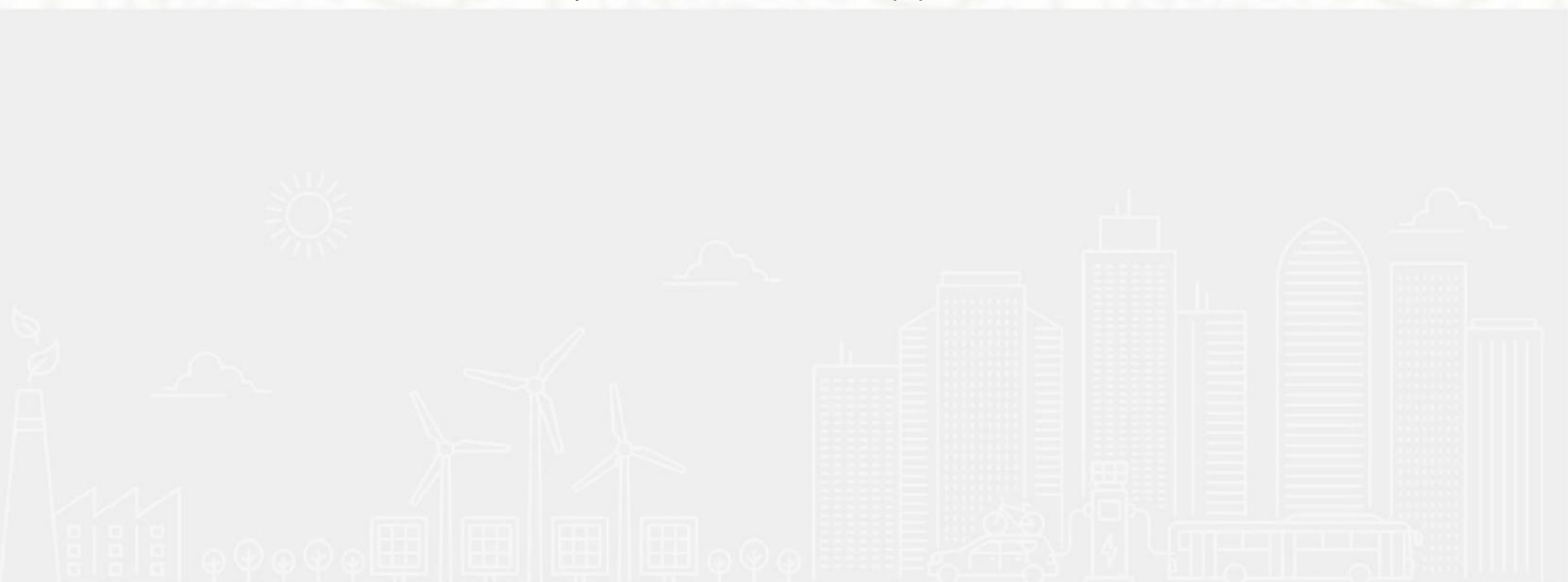
5.12. At least 1 solar panel must be operational on each Sat.



5.13. A gyroscope should be used to study the position of an object in the sky relative to the ground. The recommended module here is the MPU6050



5.14. It is free to use other auxiliary electronic modules and equipment



6. Execution of the task and calculation of points.

6.1. Each team must use a medical glove during presentation and competition.

6.2. When Sat ascends to the sky, it is evaluated with **10** points. Contact after Ascension created and can display the name of the Cubsat (can be a team name) on the monitor It will be evaluated with **10** points. Here, we will give you a 500-gram lifting effect to lift it to the sky.

6.3. **15** points will be awarded if the temperature is sent accurately ($\pm 2^{\circ}\text{C}$) . If the temperature **10** points will be given if it is close to real ($\pm 4^{\circ}\text{C}$) . If any information is sent from the temperature sensor, it will be evaluated with **5** points

6.4. **15** points will be given if air moisture value ($\pm 2\%$) is sent . If the moisture value **10** points will be given if it is close to reality ($\pm 5\%$) . If any information is sent from the moisture sensor, it will be evaluated with **5** points

6.5. **25** points will be awarded when GPS location data is sent , If the location **20** points will be given if the data is close to reality (within 1 km radius of the place) . If any data is sent from gps sensor with **5** points will be evaluated

6.6. Photo limit is 1 and **20** points are awarded. If the team took several photos can present the best of them to the judge. Numbers will be written in the landing zone during the photo and those numbers should be reflected in the picture. An additional **10** points is awarded if there is video footage during take-off

6.7. Gyroscope evaluation for degree of freedom will be given **5** points each along the X, Y and Z axis . Additional **10** points will be awarded if **3-** axis angles are sent . *The evaluation will consider the changing angles of movement during landing and takeoff.*

6.8. Each team must send their team name by SMS. According to the team name **20** points are awarded. Additionally, **10** points will be given for each data sent by SMS .

6.9. **5** points will be given for the functioning of the solar panel on the Cubesat . This process will be carried out after landing.

6.10. Once the data is sent, the SAT will be downloaded.

6.11. If the height of the satellite suspended in the air is less than **2** meters, its flight is accepted is not done and is stopped.

6.12. Each off-task team additionally uses **2** sensors and or can send different data from the same sensors. At this time, **15** points will be given for each functional information .

7. Satellite and CubeSat design evaluation

SAT 2024

Evaluation criteria:

- 7.1.** Internal electronics of CubeSat, connection of circuit elements there, **7.2.** Inter-board connections **7.3.** The arrangement of circuit elements.
- 7.4.** CubeSat body element development and design, weight and dimensions.
- 7.5.** General appearance, dimensions and innovativeness of the satellite **7.6.** Design of satellite wings and antennas

