IEEE Tunisia Section AESS Chapter

PRESENTS ITS TSYP 11 TECHNICAL CHALLENGE

Human Exploration Rover Challenge (HERC)

Welcome to the Human Exploration Rover Challenge! Join us in inspiring innovation and problem-solving in aerospace engineering by tackling real-world challenges in space exploration, from collecting Martian samples to exploring icy moon oceans.

SCOPE & TOPIC :

In the HERC, we delve into the fascinating realm of human-powered rovers, designed to overcome formidable challenges in terrestrial and extraterrestrial environments.

Inspired by NASA's missions to explore other worlds, HERC invites you to explore the boundaries of technology, engineering, and space exploration.

PROBLEM:

In the realm of space exploration, human-powered rovers play a pivotal role in enabling our journey into the cosmos.

However, these rovers face formidable obstacles that demand innovative solutions. They must adeptly navigate the rugged and unpredictable landscapes of celestial bodies, execute intricate mission tasks with precision, and make the most of limited resources in the harsh expanse of space.

The challenges extend to environments as diverse as the rocky terrains of Mars, the irregular surfaces of asteroids, and the icy depths of moons like Enceladus. Achieving reliable mobility, scientific accuracy, and resource sustainability under such conditions is no small feat.

GOALS:

The primary goal of our challenge is to foster innovation and inspire participants to design advanced features for human-powered rovers. Through this challenge, we aim to encourage problem-solving skills, hands-on learning, and teamwork in the field of aerospace engineering, all while addressing real-world issues related to space exploration.

EXAMPLES OF MISSIONS AND DIFFICULTIES TO TACKLE (but not limited to):

As you embark on the HERC journey, consider these mission scenarios and the associated challenges you may encounter:

- **Mars Sample Collection:** Overcome the difficulties presented by Mars' rugged terrain and the limited communication capabilities with Earth while collecting Martian soil and rock samples autonomously.
- **Lunar Resource Exploration:** Address the complexities of identifying and extracting valuable lunar resources while contributing to future lunar bases and sustainability. Consider the challenges of resource detection and utilization.
- **Asteroid Exploration:** Navigate the rough and irregular surface of an asteroid while collecting samples and conducting scientific experiments. Explore the unique challenges presented by the low gravity and uncertain conditions of asteroid missions.
- **Underwater Rover for Enceladus:** Dive into the complexities of exploring the subsurface oceans of icy moons like Enceladus, where challenges include operating in extreme underwater environments, ensuring autonomous navigation,

and collecting samples in challenging conditions.

- Deep Space Missions: Tackle the difficulties of deep space exploration, where communication with Earth is limited, and conditions can be extreme. Address the challenges of withstanding harsh radiation, extreme temperatures, and long-duration missions while efficiently collecting data and conducting experiments.

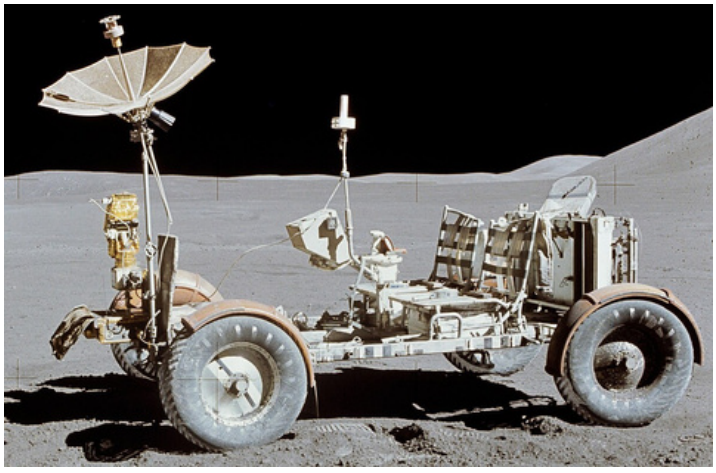
These mission scenarios and difficulties are intended to inspire your rover design proposals, but you are not limited to these examples. Feel free to explore other mission scenarios and challenges related to space exploration as you develop your innovative solutions.

INSTRUCTIONS & DELIVERABLES:

- A 15-slide presentation, to be submitted as a file (if in .pptx format) or as a link with shared open access.
- A GitHub repository link containing all the files, organized clearly and appropriately, Provide comprehensive documentation or README files that explain how to set up and run your code. and organize your code into clear directories and files, following a logical structure.
- A 3D model of the developed prototype should be provided.
- A 90-second demo video demonstrating the developed prototype based on simulation.
- A user manual for your proposed rover design, explaining how it works, how to operate it, and its key features (Optional).

RECOMMENDED RESOURCES:

- IEEE Aerospace and Electronic Systems Society
- NASA's Official Website
- NASA's Mars Exploration Program
- International Space Station (ISS)
- European Space Agency (ESA)
- NASA Technical Reports Server (NTRS)
- Robotics Business Review



SUBMISSION :

Deliverables are highlighted in the instructions and deliverables section. submitted by filling out this form

RULES AND CRITERIA :

This challenge is for SBs only, Any SB can participate in this challenge, each SB is represented by one team, with a maximum of 4 participants per team

Pitching Duration :

- 7 minutes presentation + 1.5 minutes video + 2.5 minutes Q&A

Pitching Language:

- English

Maximum Participants per Team/SB : 4

SCORING :

Total score: 20 points

Non-Technical: 8 points

- Quality of pitching and presentation: ***4 pts***
- Respect to the challenge rules & guidelines: ***2 pts***
- Creativity: **2 points**

Technical: 10 points

- Quality of proposed solution/solutions: ***6 pts***
- Technologies used: ***4 pts***

Bonus: 2 points

- Having at least one AESS member in the team: ***1 point***
- Providing a user manual for your proposed rover design, explaining how it works, how to operate it, and its key features: ***1 point***

WINNERS

- **Number of winners :** 1 Student Branch
- **Prize :** 150 $ + certificate in the student branch's name

DEADLINE FOR SUBMISSION:
9/12/2023 at 23:59 PM

For more information contact :

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