

PENS-226

Mission Asclepios: Terrestrial lunar base

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| Cursus | Sem. | Type |
|------------------------|------|------|
| Projeter ensemble ENAC | BA4 | Opt. |

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|---|---------------------|
| Language of teaching | English |
| Credits | 4 |
| Withdrawal | Unauthorized |
| Session | Summer |
| Semester | Spring |
| Exam | During the semester |
| Workload | 120h |
| Weeks | |
| Hours | 48 weekly |
| Lecture | 4 weekly |
| Exercises | 22 weekly |
| Project | 22 weekly |
| Number of positions | |
| Il n'est pas autorisé de se retirer de cette matière après le délai d'inscription. | |

Summary

This ENAC week provides students the opportunity to conduct an analysis of the interior conditions of an analog lunar base used by Asclepios to conduct simulated space missions, and to learn more about the challenges of designing controlled interior spaces in extraterrestrial environments.

Content

The MAKE Asclepios project aims to design analogous space missions, here on Earth, to simulate life on another celestial body such as the Moon. Asclepios offers a platform to perform scientific experiments and simulates to the maximum the different aspects of a space mission from the entire design of the base to the physical, psychological and scientific training of the analogous astronauts through the implementation of the Mission Control Center. In this context, the analogue astronauts live isolated inside the lunar base for two weeks, within an underground structure connecting different main rooms by tunnels.

The course proposes to first study the design and requirements of the rooms within a simulated lunar base. This will be done through a state of the art analysis taking into consideration the current conditions of the base such as low temperature and high humidity. With the help of on-site measurements and adapted software, the study will focus on comfort provision by balancing minimal energy use, human well-being and building resilience. For this, design ideas for ventilation, thermal flows, energy conservation, comfort and material selection will have to be justified within a reduced budget in order to be implemented during the mission. The project will take into account the conditions of an environment such as the Moon. The implementation of a controlled artificial light environment and the optimal occupation of the space will also be considered in order to improve the realism of the mission.

The resulting plans and protocols of this ENAC WEEK will be implemented for the Asclepios III mission during the Summer of 2023.

Keywords

Indoor climate, human habitability, indoor air quality, thermal environment, lighting, integrated design.

Learning Prerequisites**Important concepts to start the course**

Building physics, indoor environmental quality, human health and comfort

Learning Outcomes

Transversal skills

- Assess progress against the plan, and adapt the plan as appropriate.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Identify the different roles that are involved in well-functioning teams and assume different roles, including leadership roles.
- Take responsibility for environmental impacts of her/ his actions and decisions.
- Make an oral presentation.
- Demonstrate the capacity for critical thinking
- Take feedback (critique) and respond in an appropriate manner.
- Access and evaluate appropriate sources of information.

Teaching methods

In-class lectures and workshops, practical field work on-site.

Expected student activities

To participate in the course activities, ask questions, engage in discussions and debates, participate in the field data collection, analyze data, critically reflect on the result, present the project and respond to critiques.

Supervision

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| Office hours | No |
| Assistants | Yes |
| Forum | No |

Resources

Bibliography

- C-A Roulet. Santé et qualité de l'environnement intérieur dans les bâtiments.
- Peer-reviewed papers and websites as it will be provided throughout the semester.

Moodle Link

- <https://go.epfl.ch/PENS-226>