

EE-587

Space sustainability, a multidisciplinary approach

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Cursus	Sem.	Type
Electrical and Electronical Engineering	MA2, MA4	Opt.
Space technologies minor	E	Opt.

Language of teaching	English
Credits	2
Session	Summer
Semester	Spring
Exam	Oral
Workload	60h
Weeks	14
Hours	2 weekly
Courses	1 weekly
Exercises	1 weekly
Number of positions	

Summary

The students will learn the history and geopolitical challenges of space sust. Different tools and methods to measure, understand and act for space sust. will be presented. Throughout group work, the students will evaluate the technical, economical, governance and geopolitical aspects of space sust.

Content

Week 1- Introduction to Space Sustainability (measure, understand, act), the course and the group work- Definition of the three dimensions of Space sustainability
 Week 2- Geopolitics and regulations of Space Sustainability and Earth-Space Sustainability
 Week 3- Space Situational Awareness
 Week 4- The Space sustainability Rating
 Week 5- The ESA Tools- Master and Drama
 Week 6- Technologies for Space sustainability- ADR and OOS- Clearspace testimony
 Week 7- Mid term- Group work presentation
 Weeks 8-10- LCA and Eco-Design- LCA expert testimony
 Week 11- What is ESG and CSR and how does it apply to Space companies?
 Week 12- Space and the SDGs
 Week 13- Q&A about the whole course content
 Week 14- Final group work presentation

Keywords

Sustainability, Space Situation Awareness, Life Cycle Assessment, Eco-design

Learning Prerequisites**Required courses**

ENG-585- Space mission design

Recommended courses

EE-584- Spacecraft design and systems engineering

Important concepts to start the course

Orbital mechanics, protected areas, spacecraft subsystems

Learning Outcomes

By the end of the course, the student must be able to:

- Define space sustainability
- Analyze impacts of space missions on the space and earth's environment
- Quantify environmental impact
- Integrate space sustainability in system trade-off
- Contextualise technical requirements within a geopolitical and legal context

Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Use a work methodology appropriate to the task.
- Take responsibility for environmental impacts of her/ his actions and decisions.
- Respect relevant legal guidelines and ethical codes for the profession.
- Demonstrate the capacity for critical thinking
- Make an oral presentation.

Teaching methods

Presentation, exchange with experts and group work

Expected student activities

Pre-readings, participation in lectures and group work

Supervision

Office hours	No
Assistants	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

- T. Maury et al., "Application of environmental life cycle assessment (LCA) within the space sector: A state of the art", (2020)
- L. Miraux, "Environmental limits to the space sector's growth", (2022)
- A. Wilson, M. Vasile, "The space sustainability paradox", (2023)
- <https://spacesustainabilityrating.org/>
- <https://blogs.esa.int/cleanspace/>
- Space Supporting the Sustainable Development Goals
- <https://espace.epfl.ch/research/publications/>

Ressources en bibliothèque

- [Application of environmental life cycle assessment \(LCA\) within the space sector: A state of the art / Maury et al., 2020](#)
- [Environmental limits to the space sector's growth / Miraux, 2022](#)

Websites

- <https://espace.epfl.ch/research/sustainable-space-hub/>

Moodle Link

- <https://go.epfl.ch/EE-587>