

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              |
| <b>Hours</b>               | <b>2 weekly</b> |
| Lecture                    | 1 weekly        |
| Exercises                  | 1 weekly        |
| <b>Number of positions</b> |                 |

**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>