

EE-585

**Space mission design and operations**

Nicollier Claude

Cursus	Sem.	Type
Electrical and Electronical Engineering	MA2, MA4	Opt.
Mechanical engineering	MA2, MA4	Opt.
Microtechnics	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	2 weekly
<b>Number of positions</b>	

**Summary**

This course is a "concepts" course. It introduces a variety of concepts in use in the design of a space mission, manned or unmanned, and in space operations. It is partly based on the practical space experience of the lecturer.

**Content**

- Brief review of the fundamental laws of mechanics
- Types of space missions and their objectives
- The Space environment.
- Applied orbital mechanics, including interplanetary trajectories.
- Rendez-vous in space.
- Space propulsion.
- Attitude determination and control.
- On board systems.
- Space vehicles: Space Shuttle, International Space Station, Falcon 9, Dragon and Crew Dragon capsules, Starship, Hubble and James Webb Space Telescopes.
- Human Spaceflight, Extravehicular Activities and Space Robotics.

- Space sustainability.
- Future programs.

### Keywords

- Space systems
- Space research
- Space exploration
- Space engineering
- Space operations

### Learning Prerequisites

#### Required courses

- Bachelor level courses in physics, vector analysis, and calculus

### Learning Outcomes

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

- Design space mission with a given objective

### Transversal skills

- Communicate effectively with professionals from other disciplines.
- Communicate effectively, being understood, including across different languages and cultures.

### Teaching methods

Course dates (2024), all in ELA1, Mondays from 17:15 to 19:00:

February 19 (course introduction)  
February 26  
March 4  
March 11  
March 18

March 25  
April 1 No course (Easter Monday)  
April 8  
April 15  
April 22  
April 29  
May 6  
May 13  
May 20 No course (Pentecost Monday)  
May 27

An extra 2-hours course session will be scheduled to give us a complete 28-hours course. Date TBD

An optional course review will be organized in early June 2024. Date TBD

### Expected student activities

actively participate in the course and exercise sessions

### Assessment methods

oral examination

### Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

### Resources

#### Bibliography

provided in the course introduction

#### Notes/Handbook

Course notes available before each course on Moodle

#### Websites

- <http://www.nasa.gov>
- <http://www.esa.int>

#### Moodle Link

- <https://go.epfl.ch/EE-585>