

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>
Courses	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 at least 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.
- General concepts of space vehicles.
- The Space environment.
- Applied orbital mechanics, including interplanetary trajectories.
- Rendez-vous in space.
- Propulsion.
- Attitude determination and control.
- On board systems.
- Risk management.

- Examples: Space Shuttle, Space Station, Tethered Satellite, the Hubble Space Telescope.
- Extravehicular Activities.
- 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:

- Assess / Evaluate space mission goal and objectives
- Design mission to reach goal
- Assess / Evaluate competing designs

### Transversal skills

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

### Teaching methods

28 hour course in the spring semester, out of which 12 hours are exercise hours, to reinforce the concepts presented in the course.

Dates (2023), all in ELA1, 17:15 to 19:00

February 20 (course introduction)

March 6 and 8

March 20 and 22

April 3 and 5

April 17 and 19

May 1 and 3

May 15 and 17

May 31

June 5 (course review, optional)

### **Expected student activities**

actively participate in the course and exercise sessions

### **Assessment methods**

oral examination

### **Supervision**

Office hours                Yes

Assistants                 Yes

Forum                        No

### **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>