

EE-584

**Spacecraft design and system engineering**

Foing Bernard

Cursus	Sem.	Type
Electrical and Electronical Engineering	MA1, MA3	Opt.
Space technologies minor	H	Opt.
Systems Engineering minor	H	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Courses	2 weekly
TP	2 weekly
<b>Number of positions</b>	

**Summary**

The main objective of the course is to introduce the concept of space system design and engineering. The course will describe the various subsystems involved in the design of a satellite. It will also describe the techniques of systems engineering that are used to obtain a coherent satellite design.

**Content****Introduction**

Highlights of space mission organization and engineering. Mission objectives, science objectives, mission architectures.

**Conception and Design of spacecraft**

General description of the space environment and survivability, and spacecraft subsystems including: science instruments, telecommunications, power management and distribution, command and data handling, thermal control, propulsion, structures and mechanisms, configuration, end-to-end information system, flight software.

**System Engineering Techniques**

Presentation of the major system engineering techniques: functional analysis, block diagrams, design trade-offs, design budgets, interface management, tradable parameters.

**Introduction to Project Engineering**

Other project considerations for a system engineer: requirements definition and tracking, spacecraft integration and test, mission operations, reliability and quality assurance, cost and risk management.

**Keywords**

satellites, space system, space environment and orbital mechanics

**Learning Prerequisites****Required courses**

None.

**Recommended courses**

Prof. Claude Nicollier's class.

**Learning Outcomes**

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

- Structure a space project in development phases
- Formulate the tasks and responsibilities of the system engineer
- Dimension the overall system
- Dimension each satellite subsystem
- Elaborate a coherent and consistent system design
- Design a space mission
- Integrate constraints due to the space environment

### Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Use a work methodology appropriate to the task.
- Access and evaluate appropriate sources of information.
- Write a scientific or technical report.

### Expected student activities

Design work every week, mid-term report.

### Assessment methods

final report and presentation.

### Supervision

Office hours	Yes
Assistants	Yes

### Resources

#### Bibliography

"Space Mission analysis and Design", by W. Larson and J. Wertz

#### Ressources en bibliothèque

- [Space Mission analysis and Design / Larson](#)

#### Moodle Link

- <http://moodle.epfl.ch/course/view.php?id=399>