

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	Oral
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 and 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: requirement, definition and tracking, spacecraft integration and test, mission operations, reliability and quality assurance, cost and risk management.

**Individual study of a Space Mission with deliverables and a final report including:**

- Mission statement and definition, Project organization, Mission design, System Engineering, Science & instruments.
- Subsystems: Telecom, Electrical power, Structure and Configuration, C&DH, ADCS, Propulsion, Thermal.
- An executive summary and conference abstract.
- Powerpoint files for oral presentations at various stages.

**Keywords**

satellites, space system, space environment and orbital mechanics.

**Learning Prerequisites**

**Required courses**

None.

**Recommended courses**

Space Mission Design and Operations

**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, interactive presentations, mid-term report, final report and final oral presentation.

**Assessment methods**

Mid-term report, final report and oral 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**

- <https://moodle.epfl.ch/course/view.php?id=14343>