

EE-584

**Spacecraft design and system engineering**

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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	During the semester
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 learn to apply the fundamentals of space system engineering & design. The course introduces the various phases, systems, & subsystems involved in the design of spacecraft describing the techniques & best practices to plan and execute successful space missions.

**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**

spacecraft, space system, space environment, orbital mechanics, and space exploration.

**Learning Prerequisites**

**Required courses**

- Space Mission Design and Operations (EE-585) [already taken or have registered for]

**Recommended courses**

- Systems Engineering (MICRO-405)

**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.
- Make an oral presentation.
- Communicate effectively with professionals from other disciplines.

**Teaching methods**

- Interactive lectures
- Collaborative learning
- Project-based learning

**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://go.epfl.ch/EE-584>