ENG-510

Space propulsion

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Cursus	Sem.	Type
Electrical and Electronical Engineering	MA2, MA4	Opt.
Space technologies minor	E	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Oral
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

The main objective of the course is to provide an overview of space propulsion systems. The course will also describe the basic design principles of propulsion systems.

Content

Introduction in Spacecrafts - Short highlights of spacecraft design including overview on subsystems.
Introduction in Propulsion Systems - Brief overview on all space propulsion systems
Design guidelines for Propulsion Systems - Main design principles (basic performance equations) for propulsion systems considering different mission objectives
Propulsion System Architecture - Description of propulsionn subassemblies needed for the different prpulsion systems like pressurization system
Propulsion System Components - Description ofbasic equipment needed for the different prpulsion systems like pressure regulator
Performance Analysis of Propulsion Systems - Basic tools for performance of propulsion system analysis
Subsystem Aspects on Propulsion Systems - Coherence of propulsion system design with other spacecraft subsystems like structure, thermal subsystem, electrical system
System Aspects on Propulsion Systems - Coherence of propulsion system with system design like launcher stages or spacecraft architecture
Life Cycle of Propulsion Systems - Complete overview of propulsion system life cycle
Future Aspects of Propulsion Systems - Introduction in future evolution of propulsion systems as well as overview of current investigations on new propulsion systems

Keywords

Space Propulsion, Thermal Propulsio, Chemical Propulsion, Electric Propulsion, Nuclear Propulsion, Other Propulsion Systems (e.g. tether, solar wind)

Learning Prerequisites

Required courses

None

Recommended courses

Space mission design and operations
Spacecraft design and system engineering

Learning Outcomes

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

- Analyze propulsion system requirements
- Plan a project in phases
- Coordinate tasks between different engineering disciplines
- Translate system requirements into subsystem requirements
- Justify propulsion system selection

Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Communicate effectively, being understood, including across different languages and cultures.
- Identify the different roles that are involved in well-functioning teams and assume different roles, including leadership roles.
- Set objectives and design an action plan to reach those objectives.
- Respect relevant legal guidelines and ethical codes for the profession.
- Demonstrate a capacity for creativity.
- Access and evaluate appropriate sources of information.
- Make an oral presentation.

Teaching methods

Lecture every second week in English supported by excersises and project activity.

Expected student activities

Active participation in the course
Active participation in the exercise sessions
Active participation in the projet group

Assessment methods

Oral examination and excersise + project work evaluation.

Supervision

Office hours	Yes
Assistants	No
Forum	No
Others	Support by mail and / or telephone + video calls is ensured.

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Space Propulsion Analysis and Design (Humble, Henry & Larson, Space Technology Series)
Rocket and Spacecraft Propulsion (Turner, Martin J. L., Springer)
Fundamentals of Electric Propulsion: Io and Hall Thrusters (Dan M. Goebel, I. Katz, Wiley)

Ressources en bibliothèque

- Fundamentals of Electric Propulsion: Io and Hall Thrusters (Dan M. Goebel, I. Katz)
- Space Propulsion Analysis and Design (Humble, Henry & Larson)
- Rocket and Spacecraft Propulsion (Turner, Martin J. L.)

Notes/Handbook

Notes will be delivered prior to each course

Moodle Link

- https://go.epfl.ch/ENG-510