EF2260 Space Environment and Spacecraft Engineering 6.0 credits

Rymdmiljö och rymdteknik

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

The official course syllabus is valid from autumn semester 2026 as decided by the Director of First and Second Cycle Education. Decision date: 2026-04-16

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Electrical Engineering, Engineering Physics, Physics

Specific prerequisites

Knowledge of space physics, 6 credits, equivalent to completed course EF2240. Active participation in EF2240 during study period 1 of the same academic year is equated with completed course. Those who are registered are expected and considered to be active participants.

Intended learning outcomes

After the completed course you should

- develop a knowledge of the environments spacecraft may encounter in various orbits around the Earth, and the constraints this places on spacecraft design.

- have an understanding of the spacecraft/plasma interaction processes

- have a general understanding of the physics behind the radiation effects on various materials

- know the radiation tolerance ranges for major components, and assess the radiation exposure for a given orbit

- understand basic operation principles underlying the thermal control system and the power systems in spacecraft

- be able to roughly dimension the systems for a given orbit

- have understanding of measurements principles in space

Course contents

The course consists of lectures and projects.

Lectures cover the following topics: Overview of satellite design and onboard systems. Space environment, Sun, magnetosphere, radiation belts. Radiation effects on materials: physical principles, dose assessment, tolerances. Spacecraft/plasma interaction, charging. Corrosion, micrometeorites.

There will be three projects in the course. You will work in groups on the projects. Each group will concentrate on two projects. The projects are estimated to take about 1 week of work each. Each group prepares a written report and a presentation. The results are presented as a short talk at a seminar at the end of the course.

One project is designing a power supply system for a spacecraft in a given orbit. You will work from estimating the power needs the spacecraft for given application. By making some measurements on the actual solar panel elements and batteries you will dimension these elements for the spacecraft and design a regulation system.

The second project is designing thermal control system for a spacecraft. You will assess the heat balance for a given orbit, make some measurements on material properties and work towards a thermal design of the spacecraft.

The third project will concentrate on the radiation effects, primarily on the electronics. You expose some components to radiation and assess the effects, investigating the dose for permanent damage. This will be compared to the radiation levels encountered by spacecraft around the Earth.

Examination

- PRO2 - Project, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- PRO1 - Project, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Oral examination, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.