



# SD2900 Fundamentals of Space-flight 7.5 credits

Rymdteknikens grunder

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

## Establishment

Course syllabus for SD2900 valid from Autumn 2019

## Grading scale

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

## Education cycle

Second cycle

## Main field of study

Mechanical Engineering

## Specific prerequisites

Completed degree project on Bachelor level.

## Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

# Intended learning outcomes

After completing course the student should be able to

1. Demonstrate broad knowledge and understanding of the scientific basis and proven experience in spaceflight, as well as insight into current research and development work.
2. Demonstrate basic methodology and understanding of spaceflight, including launcher dynamics, orbital mechanics, manoeuvres and relative motion in orbit.
3. Demonstrate the ability to critically, independently and creatively identify, formulate and manage a geocentric space mission with a holistic view.
4. Demonstrate the ability to analyse and critically evaluate various technical solutions for a geocentric space mission
5. Demonstrate the ability to plan and, with adequate methods, carry out a feasibility study of a geocentric space mission within given frames and to evaluate this work.
6. Demonstrate the ability to critically and systematically integrate knowledge from previous courses in order to analyse, assess and deal with complex phenomena, problems and situations in spaceflight, even with limited information.
7. Demonstrate the ability to model, simulate, predict and evaluate spacecraft behaviour from launching to rendezvous with other spacecraft, even with limited information.
8. Demonstrate the ability to develop a geocentric space mission, including technical solutions, with regard to people's conditions and needs and society's goals for economic, social and ecologically sustainable development.
9. Demonstrate ability for teamwork and collaboration in culturally mixed groups.
10. Demonstrate ability to clearly present and discuss engineering conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in international contexts.
11. Demonstrate the ability to make judgments with regard to relevant scientific, societal and ethical aspects when choosing technical solutions for a geocentric space mission.
12. Demonstrate insight into the opportunities and limitations of spaceflight, its role in society and people's responsibility for how it is used, including social and economic aspects as well as environmental and work environment aspects.

For the highest grades, the student should also be able to

13. Demonstrate in-depth methodology and understanding of spaceflight.
14. Demonstrate the ability to identify his or her need for additional knowledge in spaceflight.

## Course contents

In order to create a natural and creative learning environment, a peer learning approach is used in the course. You will therefore belong to a student team that meets on a regular basis to discuss essential topics in the course and to perform project work. You will treat topics like rocket propulsion and performance, launcher dynamics, basic orbital mechanics, relative orbital motion and orbital maneuvers. The technical work in the course mainly consists of a

project assignment, typically related to a topic of current interest in the space industry. This means that the focus of the course can differ somewhat from one year to the next.

## Course literature

William E. Wiesel, Spaceflight Dynamics, 3rd ed., Aphelion Press, 2010.

The book can be purchased in the student expedition at KTH Aeronautical and Vehicle Engineering, Teknikringen 8.

## Examination

- KON1 - Conceptual Test, 3.5 credits, grading scale: P, F
- PRO1 - Project Assignment, 4.0 credits, grading scale: P, F
- TEN1 - Optional Oral Dissertation, 0.0 credits, grading scale: P, 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.

## Other requirements for final grade

Approved oral and written presentation of project work (PRO1; 4.0 credits) and approved written test or equivalent oral accomplishment (KON1; 3.5 credits).

## 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.