SD2816 Rocket Science 7.5 credits

Rocket Science

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

Establishment

Course syllabus for SD2816 valid from Autumn 2009

Grading scale

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

Education cycle

Second cycle

Main field of study

Specific prerequisites

The course is primarily intended for students in the Aerospace Engineering program (including exchange students). For as long as room is available, other students are also welcome to participate.

Language of instruction

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

Intended learning outcomes

The **overall objectives** of the course are that you should be able to

- **derive** and **explain** fundamentals of rocket propulsion, including the thrust equation, the specific impulse of a rocket engine, the rocket equation for burnout velocity and rocket staging,
- **formulate** appropriate equations of motion of a rocket vehicle, and **perform** a preliminary trajectory analysis based on these,
- **derive** and **explain** fundamentals of orbital mechanics, including Newton's law of universal gravitation, the equations of motion for the two-body problem, and the properties that are conserved along their orbital orbital and trajectory solutions, and
- on a conceptual level, **plan** a geocentric or interplanetary space mission, including the determination of suitable trajectories, the number of stages required, and the approximate energy and mass budget.

Besides from the aims related to your knowledge and skills in rocket science, the course also aims at improving your ability to

- work effectively in a culturally mixed group,
- learn with and from other students,
- approach and solve a complex engineering task,
- present your results and conclusions effectively, and
- review and give constructive feedback on work.

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 around various topics and to perform project work. You will treat topics like rocket propulsion and performance, two-body orbital mechanics, geocentric orbits and trajectories, and interplanetary transfers. The technical work in the course mainly consists of two project assignments – one on rocket dynamics and one on space mission planning, respectively.

Course literature

William E. Wiesel, Spaceflight Dynamics, 2nd ed., McGraw-Hill, 1997.

Examination

- PRO2 - Project, 3.0 credits, grading scale: P, F
- PRO1 - Project, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 1.5 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

Project assignment (PRO1; 3 university credits)
Project assignment (PRO2; 3 university credits)
Oral exam (TEN1; 1.5 university 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.