SI2372 General Relativity 3.0 credits

Allmän relativitetsteori

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

Establishment

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

English B / English 6

Language of instruction

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

Intended learning outcomes

After completing the course you should be able:

- Use differential geometry to describe the properties of a curved space.
- State Einstein's field equations, account for the physical interpretation of its components, and prove that Newton's theory of gravity is recovered in the non-relativistic limit.
- Compute physical quantities for test particles in a given solution to Einstein's field equations, e.g., particle trajectories and proper times.
- Use the FRW metric to describe the different possibilities for how a homogeneous universe develops with time.
- Give an account of the experiments with which the general theory of relativity has been tested and compare with predictions from Newton's theory of gravity.

Course contents

I. **Basic differential geometry**: Local coordinates on manifolds. Covariant and contravariant vector and tensor fields. (Pseudo-) Riemann metric. Covariant differentiation (Christoffel symbols, Levi-Civita connection). Parallel transport. Curvature of space-time.
II. **General Theory of Relativity**: Basic postulates. Einstein's field equations. Schwarzschild solution.
Experimental tests of general relativity. Introduction to cosmological models.

Examination

- TEN1 - 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.