SI2372 General Relativity 3.0 credits

Allmän relativitetsteori

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

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

Establishment

Course syllabus for SI2372 valid from Autumn 2010

Grading scale

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

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

Students in F3

Recommended prerequisites: SI2371 and good knowledge of multivariable differential calculus.

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:

- To answer the question "What is General Relativity"
- To compute basic differential geometric quantities
- To be able to use Einstein's field equations
- To handle some important solutions of the former and their applications (Schwarzschild solution etc.)
- To compute the orbits (geodesics) in some curved space-times
- Explain some experimental tests of General Relativity
- To have some familiarity with cosmological models

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.

Disposition

Course disposition: Lectures (14h) and exercise classes (4h) in period 2.

Course literature

Freely downloadable lecture notes by S.M. Carrol, gr-qc/9712019 or the same as a book, S.M. Carrrol: Spacetime and Geometry: An Introduction to General Relativity, Addison-Wesley, 2003.
Compact lecture notes with exercises, Jouko Mickelsson, Håkan Snellman, and Tommy Ohlsson: Relativity Theory, KTH, 2005.

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.

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.