

# Syllabus

for course at advanced level

**General Relativity**  
**Allmän relativitetsteori**

**7.5 Higher Education  
Credits**  
**7.5 ECTS credits**

<b>Course code:</b>	FK8025
<b>Valid from:</b>	Autumn 2017
<b>Date of approval:</b>	2016-01-16
<b>Department</b>	Department of Physics
<b>Main field:</b>	Physics
<b>Specialisation:</b>	A1F - Second cycle, has second-cycle course/s as entry requirements

## Decision

This course plan has been established by the Board of Science at Stockholm University on 2017-01-16.

## Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to passed courses (excluding introductory courses) of 45 credits in mathematics and 67.5 credits in physics, where the courses, where the courses Electromagnetism and Waves, 7.5 credits, (FK5019) and Analytical Mechanics, 7.5 credits (FK7049) should be included. Additionally, admission to the course requires knowledge equivalent upper secondary school English B/English 6.

## Course structure

Examination code	Name	Higher Education Credits
HELA	General Relativity	7.5

## Course content

The course studies:

- gravitation expressed and explained as spacetime curvature
- the description of spaces and spacetimes by means of tensors (metric, covariant derivative, the Riemann tensor)
- Einstein's field equations
- implications of general relativity: black holes, gravitational waves, cosmology
- experimental tests of general relativity

## Learning outcomes

Upon completion of the course, students are expected to be able to:

- account for the relation between the special and the general theory of relativity.
- manipulate tensor expressions and perform calculations involving tensors.
- perform calculations in order to determine physical quantities in curved spacetimes (such as spacetime distances and velocities as measured in local frames).
- account for the content of Einstein's field equations, and be able to apply them to spherically symmetric systems.
- account for black holes, gravitational waves and cosmological implications of general relativity, as well as for experimental tests of the theory

**Education**

Instruction consists of lectures.

The course will be given in English if requested by any student enrolled.

**Forms of examination**

a. The course is examined as follows: knowledge assessment takes the form of hand-in exercises and written exam. If the instruction is in English, the examination may also be conducted in English.

b. Grades will be set according to a seven-point scale related to the learning objectives of the course:

A = Excellent

B = Very good

C = Good

D = Satisfactory

E = Adequate

Fx = Fail, some additional work required

F = Fail, much additional work required

c. The grading criteria will be distributed at the beginning of the course.

d. In order to pass the course, a minimum grade of E is required.

e. Students who receive a failing grade on a regular examination are allowed to retake the examination as long as the course is still provided. The number of examination opportunities is not limited. Other mandatory course elements are equated with examinations. A student who has received a passing grade on an examination may not retake the examination to attain a higher grade. A student who has failed the same examination twice is entitled to have another examiner appointed, unless there are special reasons to the contrary. Such requests should be made to the department board.

The course includes at least two examination opportunities per year when the course is given. At least one examination opportunity will be offered during a year when the course is not given.

f. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments will take place before the next examination session.

**Interim**

Students may request that the examination be conducted in accordance with this course plan even after it has ceased to be valid. However, this may not take place more than three times over a two year period after course instruction has ended. Requests must be made to the departmental board. The provision also applies in the case of revisions to the course plan (and the revisions of the course literature).

**Limitations**

The course may not be included in examinations in combination with course General Relativity 7.5 credits(FK7001) or equivalent.

**Misc**

The course can be included as part of the master's programs offered at the Physics department, but is also offered as a separate course.

**Required reading**

The course literature is decided by the department board and published on the Department of Physics's website at least two months before the start of the course.