



Course syllabus

Faculty of Technology

Department of Physics and Electrical Engineering

4FY540 Kosmisk strålning och Högenergiastrofysik, 7,5 högskolepoäng

Cosmic rays and High Energy Astrophysics, 7.5 credits

Main field of study

Physics

Subject Group

Physics

Level of classification

Second Level

Progression

A1N

Date of Ratification

Approved by Faculty of Technology 2014-10-03

The course syllabus is valid from autumn semester 2015

Prerequisites

Bachelor of Science (Physics) and Astrophysics, 7,5 CREDITS or similar.

Objectives

The purpose of the course is to give the students the necessary basic and advanced knowledge for the understanding of the problem of the origin and acceleration of cosmic rays, together with the experimental methods chosen to investigate the problem in the past, those currently being used and those planned for the future. In addition, with this course the student has the opportunity to understand the connection between Astrophysics and Particle Physics. At the end of the course, the student is expected to know the experimental and theoretical aspects on the nature, origin and propagation of the charged cosmic rays and neutrinos.

Content

The problem of the origin of cosmic rays plays a central role in astrophysics. This course will give the students a deep knowledge of the different astrophysical processes involved in the production and acceleration of energetic particles through the cosmos and their interactions with matter and fields. The astrophysical accelerators which operate at very different scales will be presented, and then we will focus on the experimental aspects related to the detection of cosmic rays, gamma-rays and neutrinos. A selection of topics from contemporary experimental cosmic ray physics which may be included in the last part of the course are: balloon and satellite-based instrumentation for cosmic-ray studies, studying cosmic rays on the ground with large-scale hybrid detectors, detection of gamma-rays and neutrinos, studies of antimatter in space, cosmic-ray composition studies, ultra-high energy cosmic rays.

Type of Instruction

~~TYPE OF COURSE~~

The teaching consists of lectures, seminars and laboratory work.

Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.

The grade A constitutes the highest grade on the scale and the remaining grades follow in descending order where the grade E is the lowest grade on the scale that will result in a pass. The grade F means that the student's performance is assessed as fail (i.e. received the grade F).

The examination may be given in a written and oral form and consists of questions or problems. Part of the examination may be given as a written report (max 10 pages) on one of the course topics. The written report will be followed by an oral examination of the submitted material. During the oral examination the students should be able to discuss and expand upon the contents of the presentation.

Course Evaluation

A course evaluation will be carried out and compiled after the course is completed. The compilation will be presented to the current board as well as to the students and filed by the coordinating department.

Credit Overlap

The course cannot be included in a degree along with the following course/courses of which the content fully, or partly, corresponds to the content of this course: 4FY840 Cosmic rays and High Energy Astrophysics, 7.5 credits

Other

Grade criteria for the A–F scale are communicated to the student through a special document. The student is to be informed about the grade criteria for the course by the start of the course at the latest.

Required Reading and Additional Study Material

Course literature: Lectures notes, slides, articles from international journals.

Reference literature: High Energy Astrophysics, Malcolm S. Longair, Cambridge University Press, Third Edition