Linnæus University

Jnr: 2013/2980-3.1.2

Course syllabus

Faculty of Technology
Department of Physics and Electrical Engineering

4FY840 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 2013-12-16
The course syllabus is valid from autumn semester 2014

Prerequisites
Bachelor of Science (Physics) and Astrophysics, 7,5 HEC 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
The teaching consists of lectures, seminars and laboratory work.

Examination
The course is assessed with the grades Fail (U), Pass (G) or Pass with Distinction (VG).
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.

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