



PHYSICS

ASM410 Galaxies and Observational Cosmology, 7.5 higher education credits

Galaxies and Observational Cosmology, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Physics on 2008-09-16 and was last revised on 2017-06-13 to be valid from 2017-06-13, spring semester of 2017.

Field of education: Science 100%

Department: Physics

Position in the educational system

The course ASM410 is a programme course in the Physics Master Programme, as well as a single subject course at the University of Gothenburg.

The course can be part of the following programmes: 1) Complex Adaptive Systems, Master's Programme (N2CAS), 2) Physics of Materials and Biological Systems, Master's Programme (N2PMB) and 3) Physics, Master's Programme (N2PHY)

Main field of studies

Physics

Specialization

A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

To be eligible for the course ASM410 the student needs basic knowledge in mechanics.

Learning outcomes

Students who have followed the course ASM410 Galaxies and observational cosmology will be able to:

- describe the Hubble classification of galaxies and relevant time and length scales in galaxies and cosmology
- describe the various components of a galaxy and their characteristics (stars, gas, dust, dark matter)
- explain how the kinematics of the Milky Way can be inferred
- review some models for galaxies in steady state (isothermal sphere, axisymmetric potentials)
- calculate a rotation curve from given gravitational potentials
- interpret observed galactic velocity fields
- describe observed features of active galactic nuclei and models for how they can be explained
- explain the dynamics of the Friedmann model and be able to calculate the age of the Universe at a certain redshift
- describe the characteristics of the cosmic microwave background and explain the physical mechanisms causing the blackbody shape and the anisotropies
- explain the linear model for growth of perturbations and the top-hat spherical model
- review key observations on which the concordance model is based
- give a personal opinion about the current state of cosmology and be able to express it with arguments that take into account the recent observational evidence
- critically read, understand, summarize and present a scientific article on the subject

Course content

The aim of the course is to provide a comprehensive review of extragalactic astronomy and cosmology, with special emphasis on recent observational discoveries. The properties of different types of galaxies will be discussed and compared in a cosmological context. The students will gain an understanding of the galaxies that populate our universe and learn about the current cosmological model which include dark matter and dark energy. The dark energy is a component with negative pressure held responsible for the observed acceleration of the cosmic expansion. Understanding the nature of dark matter and dark energy is one of the greatest challenges of modern cosmology.

The course covers the following topics:

- Hubble's classification of galaxies
- the Milky Way galaxy
- properties of disk and elliptical galaxies
- galactic structure and dynamics, including spiral structure
active galactic nuclei (Seyfert, radio galaxies, quasars...)

- interacting and merging galaxies
- the Friedmann model of the Universe
- nucleosynthesis
- dark matter and dark energy
- the cosmic microwave background
- structure formation
- the intergalactic medium
- cosmological observations
- simulations of galaxies and cosmology

Form of teaching

The course includes lectures and exercises.

Examination constitutes of a written exam with essay questions and calculations, plus an oral and written presentation of a recent scientific article.

A student who has failed a test twice has the right to change examiner, unless weighty argument can be adduced. The application shall be sent to the board of the department and has to be in writing.

Language of instruction: English

Assessment**Grades**

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U). ECTS grades are also given on this course.

Course evaluation

The results of the evaluation will be communicated to the students and will function as a guide for the development of the course.

Additional information

The course is given jointly with Chalmers University of Technology. The Chalmers code for the course is RRY090.