



Faculty of Science

**ASTA05, Astronomy: The Universe and the Quarks - an
Introductory Course on Micro- and Macrocosmos, 7.5 credits**
*Astronomi: Universium och kvarkarna - orienteringskurs om mikro-
och makrokosmos, 7,5 högskolepoäng*
First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2012-06-14 and was last revised on 2012-06-14. The revised syllabus applies from 2012-09-03, autumn semester 2012.

General Information

The course is included in the main field of physics at the Faculty of Science and is offered by the Department of Astronomy and Theoretical Physics.

Language of instruction: Swedish

Main field of studies

Physics

*Depth of study relative to the degree
requirements*

G1N, First cycle, has only upper-secondary
level entry requirements

Learning outcomes

The objective of the course is to use interesting examples of particle physics and astronomy to provide students, with or without a background in science, with basic insights into the concepts of science.

Knowledge and understanding

On completion of the course, the students shall

- be aware of the wave-particle duality of quantum mechanics and its implications
- demonstrate knowledge of fundamental constituents and forces of the microcosm (the Standard Model of the microcosm)

- understand how knowledge of the microcosm contributes to understanding of the macrocosm and vice versa
- be aware of the structure of the universe, its evolution from the Big Bang to the present and its future
- be aware of orders of magnitude of phenomena, from the smallest to the largest
- demonstrate general knowledge of special and general relativity, dark matter and dark energy, and speculative theories beyond the Standard Model
- understand how the Standard Model and cosmological models are based on experiments and observations, and be aware of a number of such experiments and observations
- be aware of current large-scale projects within astronomy and particle physics, and understand which physical issues they mainly highlight

Competence and skills

On completion of the course, the students shall be able to

- communicate their acquired knowledge in a comprehensible manner

Judgement and approach

On completion of the course, the students shall be able to

- critically judge whether a statement within the subject is based on experimental results and observation or is pure speculation

Course content

The course introduces students to modern particle physics and cosmology, focusing on a few highly topical research areas. The components addressed are: the Standard Model for particles and forces; the origin of chemical elements; the structure and evolution of the universe from the Big Bang; the concepts of dark matter and dark energy, and observational proof of these phenomena; cosmic background radiation; effects of general relativity, e.g. the expansion of the universe and gravitational lensing; theories beyond the Standard Model.

Course design

The teaching consists of lectures, exercises and demonstrations. Participation in exercises and demonstrations is compulsory.

Assessment

The assessment is based on written assignments throughout the course and a written or oral exam at the end of the course. The type of exam will be determined in consultation with the students at the start of the course.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.

For a grade of Pass on the whole course, the student must have passed the assignments and exam, and participated in all compulsory components.

Entry requirements

General requirements for university studies in Sweden

Further information

The course may not be included in a degree together with AST223 The Challenges of the Universe, 5 credits, ASTA02 The Challenges of the Universe, 7.5 credits, AST201 Astronomy and Astrophysics, 10 credits, AST202 Introductory Course, 5 credits, AST203 The Basics of Astrophysics, 5 credits, ASTA01 Introductory Course, 7.5 credits, ASTA11 Astronomy and Astrophysics, 15 credits, or ASTB01 Introduction to Astrophysics, 7.5 credits.

Subcourses in ASTA05, Astronomy: The Universe and the Quarks - an Introductory Course on Micro- and Macrocosmos

Applies from V13

- 1201 Part Examination, 3,5 hp
Grading scale: Fail, Pass
- 1202 Examination, 4,0 hp
Grading scale: Fail, Pass, Pass with distinction