SH2405 High-Energy Astrophysics 7.5 credits

Högenergiastrofysik

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

The course plan applies from and including HT 2025 according to faculty board decision: S-2024-0066. Decision date: 2024-10-07.

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Engineering Physics

Specific prerequisites

English B/ English 6

Completed course in Astrophysics SH2404

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After passing the course, the student must be able to:

- Describe the most important physical processes that give rise to radiation in the universe. Using theories of continuum spectra to calculate the most important properties of the radiating object/medium from observed spectra.
- Explain the main points in the theories of accretion and shocks and be able to solve problems for relevant astrophysical phenomena based on the theories.
- Briefly describe compact objects (black holes and neutron stars) and phenomena related to these objects (e.g. active galactic nuclei, pulsars and gamma rays).
- Based on the above learning objectives, be able to critically evaluate different ways of using high-energy observations to study astronomical phenomena.
- Using high-energy data from space telescopes and explaining the structure of the data. Carry out simpler data analysis and be able to critically evaluate the result and put it in context with the course content.
- Be able to produce and critically assess scientific texts within a subject in the course content.

Course contents

The course provides in-depth knowledge and skills in astrophysics with a focus on high-energy astrophysics. The course covers the following topics:

- Compact objects (black holes and neutron stars) and phenomena related to these objects (eg active galactic nuclei, pulsars and gamma rays) with special focus on the radiation they produce.
- Radiation processes: Compton, synchrotron and bremsstrahlung
- Accumulation of matter (accretion) on neutron stars and black holes
- Astrophysical applications of relativity and shock physics
- Observations, data analysis and experimental methods in high energy astrophysics

Examination

- INL1 - Assignments, 3.0 credits, grading scale: P, F
- PRO1 - Project, 4.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.