



LUND
UNIVERSITY

Faculty of Science

ASTM13, Astronomy: Dynamical Astronomy, 7.5 credits

Astronomi: Dynamisk astronomi, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2007-01-31 to be valid from 2007-07-01, autumn semester 2007.

General Information

The course is a compulsory course for second-cycle studies for a Degree of Master of Science (120 credits) in astrophysics.

Language of instruction: Swedish and English

If needed, the course is given in English.

Main field of studies

Astrophysics

Physics

Depth of study relative to the degree requirements

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

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Learning outcomes

On completion of the course, the student should have acquired a good understanding of a number of basic concepts that are used to describe gravitationally dominated dynamic systems within astronomy (for example star clusters, galaxies and galaxy groups), and the ability to apply the concepts by analysing such systems by means of observational data. The student should be able to

- from basic astrometric and other observational data calculate the three-dimensional positions of the objects and their velocities
- calculate statistical kinematic properties such as the average velocity and the velocity dispersion for a selection of objects

- describe observed correlations between the statistical properties and how these vary depending on the physical properties of the objects
- explain the most important mechanisms behind these variations
- explain and apply the principles of dynamic determination of the mass or the mass densities in a dynamic system
- numerically calculate orbits for particles in a given potential
- critically discuss the uncertainty in achieved results. have obtained training
- to use a structured programming language
- to formulate and apply selection criteria for observation data so that these are suitable for statistical studies
- to carry out statistical calculations on different selections of objects
- in numerical integration of ordinary differential equations
- to present project work in written reports.

Course content

The course contains the following parts:

Newtonian gravitation and dynamics. Reference systems and units. Galactic coordinates. Astrometry and the determination of the distance, the motion and distribution of stars. The HR-diagram and the stellar colours, luminosities and ages of stars. Stellar kinematics. The motion of the sun and the local velocity standard. The rotation curve, differential galactic rotation and Oorts constants. Non-circular motion. The potential of the galaxy and galactic orbits. The phase space, the collision free Boltzmann equation and Jeans's equations. Dynamic determination of masses and mass density.

Course design

The teaching consists of lectures and group work in the form of several related projects. The projects include planning and writing a computer program to analyse observational data and carry out simulations using a model. The results of the projects are presented in written form and are discussed in groups. Participation in group work and project work and thereto integrated teaching is compulsory.

Assessment

The examination consists of project work and written examination at the end of the course. Students who do not pass the regular exam are offered a re-exam shortly after the regular exam.

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.

To pass the entire course, approved examination and passed project reports and participation in all compulsory parts are required.

The final grade is determined by combining the results in the different parts of the examination.

Entry requirements

The prerequisites required for admission to the course are: English B and knowledge equivalent to FYSA31 (Physics 3, Modern physics), 30 credits.

Further information

The course may not be included in a higher education qualification together with AST217 Dynamic astronomy 5p, AST317 Dynamic astronomy or 5p.

Subcourses in ASTM13, Astronomy: Dynamical Astronomy

Applies from H13

- 0711 Project, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction
- 0712 Examination, 2,5 hp
Grading scale: Fail, Pass, Pass with distinction

Applies from H07

- 0701 Dynamical Astronomy, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction