Level: master

Course title: Physical Cosmology

Status: elective

ECTS: 9

Requirements:

Learning objectives

The objective of the course is to introduce students to the origin, geometry and early evolution of the Universe, primarily through the perspective of key observations, which contributed to these groundbreaking discoveries. An additional goal is bringing the important open problems of contemporary cosmological research into the focus on both theoretical and observational side.

Learning outcomes

Upon successful completion of this course, students will be familiar with the most successful contemporary cosmological models and actual problems (such as, for instance, the problem of the origin and properties of the ubiquitous dark energy) and trained to apply observational tests to multiple theoretical ideas and models.

Syllabus

Theoretical instruction

Introduction; historical observations; Newtonian cosmology; Friedmann models; relativistic cosmology; Friedman-Robertson-Walker spacetimes; dark energy; cosmic microwave background; the concept of thermal history of the universe; primordial nucleosynthesis; inflation and initial conditions; cosmological density field; gravitational instability and perturbations; structure formation; weak gravitational lensing; clusters as cosmological tools; intergalactic medium at high redshift and today.

Practical instruction

In order to make the contents of the course as specific as possible, an emphasis will be put on practical aspects of particular problems, in the course of lectures, as well as homework assigned. Students will be encouraged to use astronomical resources and derive important information on the origins and evolution of the Universe from the date available. A number of numerical problems will be solved in order to give a better insight into the practical side of cosmological research.

Weekly teaching load				Other:
Lectures: 3	Exercises: 1	Other forms of teaching: 1	Student research:	