

<b>Level:</b> master				
<b>Course title:</b> Astroparticle physics				
<b>Status:</b> obligatory				
<b>ECTS:</b> 7				
<b>Requirements:</b> Nuclear physics, Particle physics				
<b>Learning objectives</b> The objective is to qualify students for understanding astroparticle physics.				
<b>Learning outcomes</b> Understanding the nature and interactions of astroparticles, dark matter and cosmic rays.				
<b>Syllabus</b>  <i>Theoretical instruction</i> Standard model: fundamental interactions, force carriers, problems of Standard model and other modern theories. Content and dynamics of Universe: principles of cosmology, distribution of matter and radiation in the Universe, dynamics of matter, red shift and Hubble law, Newtonian cosmological models, critical density and geometry of the Universe. Big-Bang nucleosynthesis and thermal relicts, Planck era, chronology of the Big-Bang; radiation, matter and expansion of the Universe, antimatter in the Universe. Cosmic microwave background radiation and cosmological parameters: discovery and origin of cosmic microwave background radiation, anisotropy of cosmic microwave background radiation, measurement of anisotropy and cosmological parameters, future experiments. Dark matter and missing mass in the Universe: problem of dark matter, dark matter candidates and dark matter search experiments. Role of neutrinos in the Universe: interactions and cross sections, solar neutrinos, supernova neutrinos, atmospheric neutrinos, high-energy neutrinos, neutrino detectors, neutrino mass and neutrino oscillations. Cosmic rays: origin and acceleration of cosmic rays, ultra high-energy cosmic rays and detection, sources of cosmic rays in Solar system, effects of cosmic rays on the Earth, cosmic gamma rays.  <i>Practical instruction:</i> Exercises, other forms of teaching and student individual and group research exercises.				
<b>Weekly teaching load</b>				Other:
Lectures: 3	Exercises: 2	Other forms of teaching:	Student research:	