

Course Unit Descriptor

Study Programme: Bachelor Academic Studies in Physics			
Course Unit Title: Particle Physics			
Course Unit Code: F18FEČ			
Name of Lecturer(s): Full Professor Dusan Mrdja			
Type and Level of Studies: Bachelor Academic Degree			
Course Status (compulsory/elective): Elective			
Semester (winter/summer): Summer			
Language of instruction: English			
Mode of course unit delivery (face-to-face/distance learning): Face-to-face			
Number of ECTS Allocated: 5			
Prerequisites: Electrodynamics, Introductory Nuclear Physics			
Course Aims: To teach students about the main aspects of experimental and theoretical particle physics			
Learning Outcomes: Understanding the principles of Standard Model and Beyond Standard Model and Particle Physics. Ability to follow the latest results in this research field.			
Syllabus: <i>Theory</i> Development of understanding of the structure of matter and concept of elementary particle. Standard model. General properties of elementary particles, fundamental interactions and interaction carriers. Virtual particles. Relationship between range of interaction and mass of interaction carrier. Antiparticles. The asymmetry of matter and antimatter in the cosmos. Units in particle physics; natural units. Feynman diagrams. Vertices. Leptons and quarks. Electromagnetic interaction. Gravitational interaction. The strong interactions and QCD as a theoretical model of strong interaction. Weak interaction. Coupling constants and the strengths of fundamental interactions. The polarization of vacuum. Conservation laws and symmetries. Conservation of lepton and baryon number. Parity. Parity violation. Running constants and grand unification of fundamental interactions. The experiments and detection techniques in high-energy physics. Review of current possibilities and perspectives of development of instrumentation in particle physics. Dark matter in cosmos and weakly-interacting massive particles - WIMP's. <i>Practice</i> -			
Required Reading: 1. D.Perkins, Particle Astrophysics, Oxford University Press, 2009.			
Weekly Contact Hours:	Lectures: 2	Practical work: 2	
Teaching Methods: Lectures, practical work and seminars.			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	Final exam	points

Active class participation	5	written exam	20
Practical work	10	oral exam	50
Preliminary exam(s)		
Seminar(s)	15		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			