

Study Programme: PhD Studies in Physics			
Course Unit Title: Rare Nuclear Events			
Course Unit Code: FD18RNP			
Name of Lecturer(s): Full Professor Istvan Bikit			
Type and Level of Studies: PhD 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: 15			
Prerequisites: Fundamentals of Nuclear Physics, Nuclear Physics			
Course Aims: Introducing students to the theory of rare nuclear processes and the most interesting experiments in this area of research.			
Learning Outcomes: Acquiring knowledge about rare nuclear processes. Practical application of some specific parts of the course.			
Syllabus:			
<i>Theory</i>			
Rare radioactive decays (cluster emission, spontaneous fission, proton decay). Neutrino interactions and neutrino mass (the neutrinoless double beta decay, neutrino flavour oscillations, the problem of solar neutrinos, the H3 beta decay). Search for dark matter in the universe. Neutrino astronomy. Rare electromagnetic processes (accelerated decay of metastable states). Cosmic-ray physics (the interaction of cosmic muons with matter). Imaging by cosmic-ray muons.			
<i>Practice</i>			
Individual research work in the form of seminars – presentations.			
Required Reading:			
1. H.V. Klapdor-Kleingrothaus and A. Staudt, Non-accelerator Particle Physics, IOP Publishing, London, 1995.			
2. P. Povinec, Rare Nuclear Processes, World Scientific, Singapore, 1992.			
3. J.N. Bahcall: Neutrino Astrophysics, Cambridge Univ. Press, Cambridge, 1990.			
Weekly Contact Hours:	Lectures: 4	Practical work: 6	
Teaching Methods: Lectures and seminars.			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	Final exam	points
Active class participation	5	written exam	
Practical work	10	oral exam	70
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.