Course Unit Descriptor

Study Programme: PhD in Physics

Course Unit Title: Interactions of Cosmic Rays

Course Unit Code: FD18IKZ

Name of Lecturer(s): Full Professor Dusan Mrdja

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: Nuclear Instrumentation, Nuclear Physics

Course Aims:

Introducing students to the characteristics of cosmic radiation at the Earth's surface and interactions of cosmic rays with a medium.

Learning Outcomes:

Understanding the principles of interactions of cosmic rays with a medium and knowledge on application of cosmic-ray muons for imaging of different structures**.**

Syllabus:

Theory

Production of secondary cosmic radiation in atmosphere. Components of cosmic radiation on the Earth's surface. Variations of flux of cosmic radiation. Low-energy photon ionizing radiation of cosmic origin. The energy and angular distribution of the muon component of cosmic radiation. Electromagnetic and nuclear processes in materials induced by cosmic radiation. The interaction of cosmic-ray muons. The interactions of cosmic-ray neutrons. Cosmogenic radionuclides. Detection of cosmic radiation. Coincident techniques for the detection of cosmic radiation. Cosmic-ray muons deep below the Earth's surface. Simulations of the interaction of cosmic radiation. Muon imaging techniques with applications.

Practice

Acquisition and analysis of data obtained from the interactions of muons with the plastic scintillation detector.

Required Reading:

1. P.F.K. Grieder, Cosmic Rays at Earth, Elsevier Science, 2001.

2. T.J. Gaisser, Cosmic Rays and Particle Physics, Cambridge University Press, 1990.

3. T.J. Dunai, Cosmogenic Nuclides Principles, Concepts and Applications in the Earth Sufrace Sciences, Cambridge University Press, 2010.

Weekly Contact Hours:	**Lectures:** 6	**Practical work:** 4

Teaching Methods:

Lectures, practical work and seminars.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class	5	written exam	

participation			
Practical work	5	oral exam	70
Preliminary exam(s)		…….	
Seminar(s)	20		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			