Course Unit Descriptor

Study Programme: Master Academic Studies in Physics

Course Unit Title: Advanced Nuclear Physics

Course Unit Code: M18VKNF

Name of Lecturer(s): Full Professor Dusan Mrdja

Type and Level of Studies: Master Academic Degree

Course Status (compulsory/elective): Elective

Semester (winter/summer): Winter

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 8

Prerequisites: Introductory Nuclear Physics, Nuclear Physics

Course Aims:

Introducing students to the methods of modern nuclear physics, together with rare nuclear processes.

Learning Outcomes:

Gaining knowledge about methods of modern nuclear physics, which are applied in the research field of nuclear physics and the study of rare nuclear processes.

Syllabus:

Theory

Form factor and distribution of charge of nucleus. Electromagnetic moments of nucleus. The interaction of the nuclear charge distribution with external electric field. Fermi theory of beta decay. Nuclear astrophysical processes. Modern methods of nuclear physics (Investigation of nucleus by Coulomb's excitation. Spectroscopy of nucleus after neutron capture. Measurement of half-lives of nuclear excited states. The angular correlation of nuclear radiation. Low-temperature nuclear orientation. In-beam spectroscopy.) Rare nuclear processes (Proton decay. Neutrino interactions and neutrino mass. Double-beta decay. Problem of solar neutrinos. Neutrino oscillations. The excitation and deexcitation of the isomeric states. LEGINT process. Cluster radioactive decay.).

Practice

Introduction to the basic uses of the equipment necessary for the double-beta decay detection. Practical and laboratory work.

Required Reading:

1. J.M. Person, Nuclear Physics: Energy and Matter, Adama Hilger Ltd, Bristol, 1986.

2. N.A.Jelley, Fundamentals of Nuclear Physics, Cambridge University Press, 1990.

3. K.S. Krane, Introductory Nuclear Physics, John Wiley&Sons, New York, 1988.

Weekly Contact Hours:	**Lectures** 3**:**	**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 participation	5	written exam	20
Practical work	5	oral exam	50
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.			