Course Unit Descriptor

Study Programme: Physics

Course Unit Title: Nuclear Energy

Course Unit Code: M18NE

Name of Lecturer(s): Full Professor Miodrag Krmar

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: -

Course Aims:

To introduction students to the processes of fission and fusion, with the basic principles of fission and fusion transformation of nuclear energy and controlled fission and fusion plants.

Learning Outcomes:

General Skills:

Upgrading of existing knowledge in the field of fission and fusion nuclear reactions, and obtaining a general picture of modern nuclear energy.

Specific Competencies:

Understanding and adopting the general principles of nuclear energy transformation including techniques and technologies frequently used in commercial nuclear energy plants.

Syllabus:

Theory

Nuclear Fission (Chain Reaction, Critical Mass, Sections, Multiplication Factor.) Fission reactors (Homogeneous and heterogeneous reactor, reactor shutdown, multiplication factor change, reactor control, reactor types).

Cycles of nuclear fuel. Environmental problems. Structure of the power plant.

Nuclear fusion (Fusion reactions - cross sections. Energy balance and burning conditions in fusion reactors).

Methods for heating plasma fusion (heating, trap with magnetic mirrors, adiabatic and shock compression).

Fusion plasma confinement (Tokamak devices, inertial confinement, laser radiation interaction with target).

Practice

Calculus and individual term paper.

Required Reading:

1. R.L. Murray, Nuclear Energy, Elsevier, 2009
2. W.M. Stacey, Nuclear Reactor Physics, Wiley-VCH, 2007
3. W.M. Stacey, Fusion, Wiley-VCH, 2010
4. G. McCracken, P. Stott, Fusion, Elsevier, 2005

Weekly Contact Hours:	**Lectures:** 3	**Practical work:** 2

Teaching Methods:

Lectures, seminars and practical work.

Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class participation	10	written exam	-
Practical work	20	oral exam	70
Preliminary exam(s)	-	…….	
Seminar(s)	-		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			