Course Unit Descriptor

Study Programme: Physics

Course Unit Title: Essentials of Nuclear Medicine Physics

Course Unit Code: M18FONM

Name of Lecturer(s): Full Professor Nataša Todorović

Type and Level of Studies: Master Academic Degree

Course Status (compulsory/elective): Compulsory

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:

The main objective of this course is to introduce students to the basics of physical application of radioisotopes in the diagnosis and therapy, as well as the basic principles of the protection of patients and medical staff performing diagnostic and therapeutic procedures in nuclear medicine.

Learning Outcomes:

General Skills:

Students acquire knowledge of the physical principles of nuclear medicine.

Specific Competencies:

Students acquire knowledge of: artificial radioisotopes production used in nuclear medicine, development of detectors for measuring radioactivity and devices for scintigraphy, introduction to diagnostic and therapeutic procedures in nuclear medicine, introduce to operation with open sources of ionizing radiation and the principles of radiation protection.

Syllabus:

Theory

Physical basis of nuclear medicine: The main types of radioactive decay (α-decay, isobaric and isomeric transitions), metastable state, interaction of α, β and γ radiation with the substance. Detection of radioactivity. Gamma scintillation counter. Pulse analyzer, counter system and visualization.

Radioactive labels in Nuclear Medicine: The discovery of radioactivity. Production of artificial radioisotopes in a nuclear reactor and ciclotron. Isotopes in medicine. Nuclear Medicine as an in vivo application of radio-tracer. Application of the open radioisotope soureces in in vivo and in vitro diagnosis and in therapy. Production of radioactive labeled compounds (the radiopharmaceuticals). Detectors for radioactivity measurement and for scintigraphy. Biodistribution of radiopharmaceuticals and radionuclides in the human body. Scintigraphy, scintigraphy processing. Scintigraphy: apparatus, gamma camera, SPECT (single photon emission computed tomography), PET / CT (positron emission tomography / computed tomography). Analog and digital images, reconstruction algorithms and analysis of the digital data. The use of nuclear-medical methods in in-vivo studies..

Practice

Experimental and computational exercises.

Required Reading:

1. Nuclear Medicine Physics, A Handbook for Teachers and Students. Editori: D.L. Bailey J.L. Humm A. Todd-Pokropek

A. van Aswegen. International Atomic Energy Agency, 2014. ISBN 978–92–0–143810–2.

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

Teaching Methods:

Lectures, seminars and practical work.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation	-	written exam	20
Practical work	20	oral exam	50
Preliminary exam(s)	-	…….	
Seminar(s)	10		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.