Course Unit Descriptor

Study Programme: Physics

Course Unit Title: Medical Use of Radioisotopes

Course Unit Code: FD18DTR

Name of Lecturer(s): Full Professor Nataša Todorović, Assistant Professor Silvija Lučić

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: -

Course Aims:

Acquiring knowledge of the fundamental physical aspects of radioactivity and handling with open radiation sources in medical diagnostics and therapy.

Learning Outcomes:

General Skills:

Student acquires knowledge, skills and competence for interpretation of physical processes and physical phenomena in the field of medical uses of radioisotopes.

Specific Competencies:

Introduction of students with radioisotopes which are used in diagnosis and therapy, the production of radionuclides, the principles of detection, as well as the latest developments in the field of radioisotopes diagnosis and therapy and the ability for understanding professional literatures.

Syllabus:

1. Nuclear Physics, 2. Positron emission tomography (PET), 3 .Single photon emission tomography (SPECT), 4. Image Analysis 5. Gamma Camera, Spectrometers 6, 7 Instrumentation 8 Statistics of counting (detection).

Physics of nuclei. Alpha, beta, gamma decay. Radioactive series. Radioactive equilibrium. Production of radionuclides. Radioisotope generators. Statistical nature of radioactive processes. Radiation detectors and detection systems. Mechanisms of scintillation process. Scintillation detectors. Photomultipliers. ADC converters analog to digital signals. Single-channel analyzers. Multichannel analyzers. Interaction of radiation with detectors. Analysis of signals in the spectrum. Approximation of detector crystal size. Identification of isotopes. Scintillation distribution. Algorithms for analyzing collected data. Algorithms for reconstruction. Sensitivity, scattering, and attenuation problems. Statistical limitations. Calibration and quality control. The artifacts. Process of detection.

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.

2. Radiation Detection and Measurement, Glenn F. Knoll Wiley, 2000. ISBN 0471073385.

3. Practical Nuclear Medicine, Peter F. Sharp, Howard G. Gemmell and Alison D. Murray. Springer, 2005. ISBN 1-85233-875-X.

4. Radiation Protection, J. Shapiro, Hardvard University Press, 2002. ISBN0-674-00740-9.

5. Radiation Physics for Medical Physicists, Ervin B. Podgoršak Springer, 2010. ISBN 9783642008740.			
Weekly Contact Hours:	**Lectures:** 6	**Practical work:** 4	
Teaching Methods: Lectures, seminars and practical work.			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	**Final exam**	points
Active class participation	5	written exam	20
Practical work	10	oral exam	50
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.			