

Subject: Medical Use of Radioisotopes		
Number of ECTS: 15		
Requirement:		
Course goals Acquiring knowledge of the fundamental physical aspects of radioactivity and handling with open radiation sources in medical diagnostics and therapy		
Outcome -General ability: student acquires knowledge, skills and competence for interpretation of physical processes and physical phenomena in the field of medical uses of radioisotopes - Specific abilities: 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.		
Outline 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.		
Literature 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, Harvard University Press, 2002. ISBN0-674-00740-9 5. Radiation Physics for Medical Physicists, Ervin B. Podgoršak Springer, 2010. ISBN 9783642008740		
Number of active teaching	Theoretical classes: 6	Study research: 4
Teaching methods Theoretical study is carried out using modern methods of presentation, with the active participation of the student, and practical teaching includes laboratory exercise and presentation of seminary work.		