Study program	Level of studies		**Second cycle**	
	Study program name		**Physics Education**	
Course name	**PHYSICS OF IONIZING RADIATION I**			
Course ID	Semester	Course status	ECTS credits	L+E
PAP7521	**III**	**ELECTIVE**	**5**	**2+2**
Lecturer				
Aims and intended learning outcomes	The aim of this course is to deepen students' basic knowledge of nuclear physics as a base for further study of medical radiation physics. After completing the course, students should: - Understand the basis of the processes at atomic nucleus level and conditions for atomic nucleus stability; - Be familiar with mechanisms of ionizing radiation emission and its application in technology and medicine.			

Course content

Structure of the atomic nucleus. Nuclear forces. Conditions for nuclear stability. A liquid drop model, Bethe-Weizsacker formula. Testing beta stability by Bethe-Weizsacker model. Radioactive elements Tc (technetium) and Pm (promethium). Shell model, magic numbers. Other nuclear models. Radioactivity: The law of radioactive decay. Decay series. Secular equilibrium compound decay, transient equilibrium compound decay. Complex radioactive decay. Natural and artificial sources of ionizing radiation. Production and use of radionuclides.

Alpha disintegration: The alpha decay theory. WBK method. Geiger-Nuttall's rule. Beta disintegration: Beta plus and beta minus decay, conservation laws for beta disintegration. Violation of parity. Fermi's theory of beta decay. Electron capture (EC). Gamma decay: basics of the theory of gamma radiation. Isomeric transitions. Forbidden transitions. Internal conversion (IC) and Auger electrons. Nuclear reactions. Nuclear reaction cross-section. Nuclear fission. Nuclear fusion. Production and properties of X-radiation. X-ray spectrum: Characteristic and continuous X-radiation.

Student workload (hours)		Grading	
Lectures and Exercises	60	Assessment method	Points
Exam preparation	55	Midterm exams	40
Assignments	10	Seminar	20
Total	125	Final exam	40
		Total	100

Literature

1. D. Samek,L. Saračević , A. Lagumdžija, Fizika jonizirajućih zračenja, Veterinarski fakultet Univerziteta u Sarajevu, 2010
2. A. Lagumdžija, D. Samek, R. Musemić, Fizika jonizirajućih zračenja u primjeni, PMF Univerziteta u Sarajevu 2010
3. Corresponding material from the web-site "e-nastava" and notes from the lectures.
Additional readings:
1. H. Johns, J. Cunningham, The physics of radiology, Charles C Thomas Publisher, Springfield, Illinois 1983
2. E. B. Podgorsak, Radiation oncology physics, IAEA 2005
3. S. N. Ahmed, Physics & engineering of radiation detection, 2nd edition, Elsevier 2015

Remarks

A student must win a minimum of 22 points on partial exams in order to enter the final exam. To successfully pass, at the final exam the students must score at least 22 points, and the total score must be at least 55 points.