Program	Level of studies		First cycle	
	Program name		Physics	
Course name	MEDICAL RADIATION PHYSICS II			
Course ID	Semester	Course status	ECTS credits	L+E
PAP8631	VIII	ELECTIVE	6	2+2
Lecturer	Doc. Dr. Adnan Beganović			
Aims and intended learning outcomes	Aim: Adopt basic knowledge in medical radiation physics and radiation protection. Outcomes: to understand the basics of dosimetry of ionizing radiation and radiation biology; master and understand the basic methods and techniques used in modern radiotherapy, diagnostic radiology and nuclear medicine, and apply them in medical practice; understand the basic principles of radiation protection, and apply them consistently in medical practice.			

Course content

1. Instruments and techniques for measuring ionizing radiation in human radiology: Ionization chamber; Geiger-Müller counter; Solid state detectors; Thermoluminescent dosimetry (TLD); Chemical dosimeters; Film dosimeters; Calorimeters; Counting statistics; Exercises.
2. Radiotherapy I: Biological basis of radiotherapy; Fractionation; Dose modification factor; Biological and physical models for optimization; Radiotherapy process; Determination of the absorbed dose at the reference point; Dose distribution by depth; Dose variation depending on SSD, field size and energy; Electronic beams; Dose gradient; Dosimetry protocols; Calibration of radiotherapy devices; External radiotherapy and brachytherapy; QA and protection against radiation in therapy; Exercises.
3. Radiotherapy II: Radiotherapy planning; Algorithm for the calculation of the dose distribution; The role of CT scanners and CT simulators in the planning process; Planning system; Optimization of treatment; Wedge filters, compensators, protection blocks and patient immobilisation devices; Basics of 2D and 3D planning; Special treatment techniques; TBI; Stereotaxy; IMRT; VMAT; Exercises.
4. Nuclear medicine: Radiopharmacology; Production of radionuclides; Generators; Localization mechanisms; Radioimmunoassays; Detectors and collimators in Nuclear Medicine; Scanners; Creating an image of individual parts of the body and organs using radioactive sources; Gamma camera; SPECT and PET; Radioactive tracers; Biological and effective time of half-life; Introduction to the MIRD model; Biokinetics of Radioactive Substances; QC in Nuclear Medicine; Exercises.
5. Diagnostic Radiology: Introduction; Primary radiographic image; Radiographic image; Characteristics and quality of the radiographic image; Radiographic film; Television techniques; Optimizing the device for creating a radiographic image; Tomography and stereo-diagnostics; Digital radiography; DSA; Mammography; CT device; Quality assurance in diagnostic radiology; Measurement and assessment of patients dose; Radiation risk in diagnostic radiology; Exercises
6. Radiation Protection: Equivalent and effective dose; Background radiation; Protective barriers; Protection in institutions that use ionizing radiation sources; Committed effective dose and collective dose; ICRP principles; Workplace monitoring; Waste management and transportation of nuclear and radioactive materials; Exercises.

Student workload (hours)		Grading	
Lectures and Exercises	60	Assessment method	Points
Exam preparation	75	Midterm	45
Other	15	Final	45
Total	150	Activity	10
		Total	100

Literature

1. Dance DR, Christofides S, Maidment ADA, McLean ID, Ng KH, editors. Diagnostic Radiology Physics: A Handbook for Teachers and Students. Vienna, Austria: IAEA; 2014.
2. Pdgoršak EB, editor. Review of Radiation Oncology Physics: A Handbook for Teachers and Students. Vienna, Austria: IAEA; 2005.
3. Bailey DL, Humm JL, Todd-Pokropek A, van Aswegen A, editors. Nuclear Medicine Physics: A Handbook for Teachers and Students. Vienna, Austria: IAEA; 2014.
4. Johns HE, Cunningham JR. The Physics of Radiology. 4th ed. Springfield, IL: Charles C Thomas; 1983.

Remarks

Exercises are performed at the Clinical Centre of Sarajevo University.