

PROGRAM OF THE CERTIFIED TRAINING COURSE OF RADIOPHARMACY

JANUARY 16 – MARCH 10, 2017

WEEK 1 16 – 20.01.2016	TOPICS	ACTIVITIES	HOURS	PLACE
16.01.2016	Opening of the Course Introduction in Radiopharmacy Visit the Laboratory of Radiopharmacy	Theory Prof. Emilija Janevik Mr.sci. Marija Sterjova Mr.sci. Paulina Efremova	9.00 – 10.00 10.00 – 13.00 14.30 – 16.30	UGD
17.01.2016	Introduction to Nuclear medicine physics - Structure and Properties of Atoms - Radioactivity, Radiation and Radioactive Decay, Decay schemes of Radionuclides Load in Nuclear Medicine, Units of Radiation Measurement Instrumentation, measurement, calculation, dosimetry	Theory Prof. Zdenka Stojanovska Practice (group of 4-6 persons) Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski	9.00 – 13.00 14.00 – 17.00	UI PET
18.01.2016	Radiation protection, safety and Regulation - Interactions of Radiation with Matter - Instruments for Radiation Detection and Measurement - Principles of Radiation Protection - Radiation Protection - Area Monitoring (Personnel and Work Environment) Instrumentation, measurement, calculation, dosimetry	Theory Prof. Zdenka Stojanovska Practice (group of 4-6 persons) Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski	9.00 – 13.00 14.00 – 17.00	UI PET

19.01.2016	Holiday – organizing visit to Skopje			
20.01.2016	Occupational and Non-Occupational Exposure Radiation - Radioactive Packages and Sources - Radioactive and Biohazardous Waste Disposal Methods - Radiation Safety, Radiation Accidents - Health Physics Regulations – National, EU, world-wide, IAEA standards Instrumentation, measurement, calculation	Theory Dr.Sci. Marina Zdraveska-Kocovska Practice (group of 4-6 persons) Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski	9.00 – 13.00 14.00 – 17.00	UI PET
WEEK 2 23 – 27.01.2016	TOPICS	ACTIVITIES	HOURS	PLACE
23.01.2016	Basic principle of pharmacy and pharmaceuticals Basic Pharmaceutical Technology Sterile Manufacture Pharmaceutical microbiology Parenteral Preparations	Theory Prof. Bistra Angelovsla Ass. Prof. Elena Drakalska	9.00 – 13.00 14.30 – 16.30	UGD
24.01.2016	Pharmacopoeia monographs Stability and Shelf Life Regulations and Legal Aspects Marketing Authorizations	Theory Prof. Bistra Angelovsla Ass. Prof. Elena Drakalska	9.00 – 13.00 14.30 – 16.30	UGD
25.01.2016	Formulation and Packaging Magistral preparations Industrial radiopharmacy , hospital pharmacy Pharmacovigilance	Theory Prof. Bistra Angelovsla Ass. Prof. Elena Drakalska	9.00 – 13.00	UGD

	Introduction to Radiation Biology	Ass. Prof. Katarina Smilkov	14.30 – 16.30	
26.01.2016	Electrochemistry of common radionuclide	Theory Prof. Rubin Gulaboski	9.00 – 13.00	UGD
	In vivo kinetics of radiopharmaceuticals - Absorption, distribution, metabolism, elimination	Ass. Prof. Katarina Smilkov	14.30 – 16.30	
27.01.2016	Freeze drying in the production of Radiopharmaceuticals	Theory Ass. Prof. Katarina Smilkov	9.00 – 13.00	UGD
	Chromatographic techniques for Quality control of freeze dried Radiopharmaceuticals Gel filtration / HPLC	Practice Mr.sci. Marija Sterjova Mr.sci.Paulina Efremova	14.30 – 16.30	
WEEK 3 30.01 - 03.02.2016	TOPICS	ACTIVITIES	HOURS	PLACE
30.01.2016	Introduction of operation in a GMP facility for PET Radiopharmaceuticals	Theory Prof. Emilija Janevik	9.00 – 12.00	UI PET
	Production of PET Radiopharmaceuticals - PET GMP facility	Practice (group of 4-6 persons) Mr. Maja Velickovska Mr.sci. Marija Atanasova Mr.sci. Katerina Kolevska Mr.sci. Filip Jolevski Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski Mr.sci.chem. Maja Coceska	13.00 – 17.00	

31.01.2016	Quality control of radiopharmaceuticals – general aspects Quality control of radiopharmaceuticals - Radionuclidic purity - Radiochemical purity - be able to determine amount of radiochemical impurities - Thin layer chromatography, Solvent extraction, Column chromatography - low pressure and HPLC, Precipitation with filtration or centrifugation Pharmaceutical purity – pH, Visual inspection, Chemical tests, Cell viability, Antigen excess	Theory Prof. Zorica Arsova-Sarafinovska	9.00 – 13.00 14.30 – 16.30	UI PET
01.02.2016	Occupational and non occupational exposure Radioactive waste disposal methods Radiation safety and accidents Radioactive packages and sources IAEA standards, health physics regulation	Theory Dr. Marina Zdraveska-Kocovska Practice (group of 4-6 persons) Dr. Marina Zdraveska-Kocovska Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski	9.00 – 13.00 14.30 – 16.30	UI PET
02.02.2016	Good Radiopharmaceutical Practices – Regulation Aspects Principle of GMP and facility design	Theory Prof. Emilija Janevik Practice Prof. Emilija Janevik	9.00 – 13.00 14.30 – 16.30	UI PET
03.02.2016	Quality control of radiopharmaceuticals - Equipment Tests - proper operation of laminar airflow hoods, exhaust hoods, centrifuges and balances through standard in house or independent laboratory test methods Principle of GMP and facility design	Theory Prof. Zorica Arsova-Sarafinovska Practice Prof. Emilija Janevik	9.00 – 13.00 14.00 – 15.30	UI PET

	Drug- Radiopharmaceuticals Interaction	Theory Mr. Aschalew Alemu (Mater student)	15.30 – 16.30	
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WEEK 4 06-10.02.2016	TOPICS	ACTIVITIES	HOURS	PLACE
06.02.2016	Radiopharmaceuticals SPECT Radiopharmaceuticals Technetium Generator Labeling of 99m Tc Radiopharmaceuticals	Theory Research Assistant Prof. T.Tripunoski Practice (group of 10 persons) Research Assistant Prof. T.Tripunoski Ing. M. Stojmirov	9.00 – 12.00 13.30 – 15.30	Medical faculty IPNM
07.02.2016	Quality Control of SPECT Radiopharmaceuticals QC of SPECT Radiopharmaceuticals	Theory Research associate Prof. S. Kuzmanovska Practice (group of 10 persons) Ing. M. Stojmirov Reasarch associate Prof. S. Kuzmanovska	9.00 – 12.00 13.00 – 15.30	Medical faculty IPNM
08.02.2016	Blood cell labelling Blood cell labelling	Theory Research Assistant Prof. T.Tripunoski Practice (group of 10 persons) Ing. M. Stojmirov Research Assistant Prof. T.Tripunoski	9.00 – 12.00 13.00 – 15.30	Medical faculty IPNM

09.02.2016	In vitro analysis– RIA, IRMA	Theory Research associate Prof. S. Kuzmanovska	9.00 – 12.00	Medical faculty IPNM
	Blood cell labelling	Practice (group of 10 persons) Ing. M. Stojmirov	13.00 – 15.30	
10.02.2016	Clinical application of SPECT radiopharmaceuticals	Theory Doc. Venjamin Majstorov Doc. Ana Ugrinska	9.00 –15.30	Medical faculty IPNM
	Clinical application of SPECT radiopharmaceuticals	Practice Doc. Venjamin Majstorov Doc. Ana Ugrinska		
WEEK 5 13-17.02.2016	TOPICS	ACTIVITIES	HOURS	PLACE
13.02.2016	PET radioisotope production and radiopharmaceutical preparation - cyclotron produced radioisotopes	Theory Dr.sci. Marina Zdraveska-Kocovska	9.00 – 13.00	UI PET
	Radiopharmacy management software Exercise – dose calculation	Practice (group of 11 persons) Mr.pharm.Maja Velickovska Mr.sci. Marija Atanasova Mr.sci. Katerina Kolevska Mr.sci. Filip Jolevski Mr.sci.chem. Maja Coceska	14.00 – 17.00	
14.02.2016	Recent advancement in the production of medical radionuclides	Theory Prof. Adriano Duatti	9.00 – 13.00	UI PET

	Radiopharmacy management software Exercise – dose calculation	Practice (group of 11 persons) Mr.pharm.Maja Velickovska Mr.sci. Marija Atanasova Mr.sci. Katerina Kolevska Mr.sci. Filip Jolevski Mr.sci.chem. Maja Coceska	14.00 – 17.00	
15.02.2016	Chemistry Aspects in the preparation of Iodine Radiopharmaceuticals	Theory Prof. Emilija Janevik	9.00 – 12.00	UI PET
	In vitro analysis using radioisotope – RIA, IRMA	Practice Research associate Prof. S. Kuzmanovska	13.00 – 16.00	IPNM
16.02.2016	Radiometal radiopharmaceuticals - Cu-64, Zr – 89, radiopharmaceuticals,	Theory Prof. Adriano Duatti	9.00 – 11.00	UI PET
	Radiometal radiopharmaceuticals - Ga-68 radiopharmaceuticals	Prof. Emilija Janevik	11.00 – 13.00	
	PET radioisotope production (F-18/C-11/N-13) PET Radiopharmaceutical Production (F-18/C-11/N-13)	Practice (group of 7-8 persons) Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski Mr.pharm.Maja Velickovska Mr.sci. Marija Atanasova Mr.sci. Katerina Kolevska Mr.sci. Filip Jolevski Mr.sci.chem. Maja Coceska	14.00 – 17.00	
17.02.2016	Quality assurance and quality management systems (including documentations)	Theory / Discussion Ass. Prof. Aleksandar Cvetkovski	9.00 – 13.00	UI PET

	PET radioisotope production (F-18/C-11/N-13) PET Radiopharmaceutical Production (F-18/C-11/N-13)	Practice (group of 7-8 persons) Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski Mr.pharm.Maja Velickovska Mr.sci. Marija Atanasova Mr.sci. Katerina Kolevska Mr.sci. Filip Jolevski Mr.sci.chem. Maja Coceska	14.00 – 17.00	
18.02.2017	The importance of Good Education in Radiopharmacy Regulation in Radiopharmacy	Theory / Discussion Mr. Uday Bhonsle	9.00 – 13.00	UI PET
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WEEK 6 20-24.02.2016	TOPICS	ACTIVITIES	HOURS	PLACE
20.02.2016	PET radioisotope production and radiopharmaceutical preparation - F18 radiopharmaceuticals - syntesis, production, dispensing, distribution PET Radiopharmaceutical Preparations (F-18/C-11/N-13) Quaity control of PET Radiopharmaceutical Preparations (HPLC, GC, ITLC, pH, LAL) Calibration of the instruments (dose calibrator / alfa,beta,gama spectrometer)	Theory Dr. sci. Dmitry Soloviev Practice (group of 4 persons) Mr.pharm.Maja Velickovska Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski Mr.sci. Marija Atanasova Mr.sci. Katerina Kolevska Mr.sci. Filip Jolevski Mr.sci.chem. Maja Coceska	9.00 – 13.00 14.00 – 17.00	UI PET
21.02.2016	PET radioisotope production and radiopharmaceutical preparation - C-11 radiopharmaceuticals - syntesis, production, dispensing, distribution - Other PET radiopharmaceuticals	Theory Dr. Dmitry Soloviev	9.00 – 13.00	UI PET

	PET Radiopharmaceutical Preparations (F-18/C-11/N-13) Quality control of PET Radiopharmaceutical Preparations (HPLC, GC, ITLC, pH, LAL) Calibration of the instruments (dose calibrator / alfa,beta,gama spectrometer)	Practice (group of 4 persons) Mr.pharm.Maja Velickovska Mr.sci. Saso Nikolovski Med.Phys. Zlatko Filipovski Mr.sci. Marija Atanasova Mr.sci. Katerina Kolevska Mr.sci. Filip Jolevski Mr.sci.chem. Maja Coceska	14.00 – 17.00	
22.02.2016	Theranostic Radiopharmaceuticals Overview of radiopharmaceuticals for therapy Introduction of importance to use animal models in the research Basic anatomy of animals used in research	Theory Prof. Adriano Duatti Dr.sci. Francesca Ravanetti Prof. Luisa Ragioneri	9.00 – 12.00 13.30 – 15.00 15.00 – 16.30	UI PET
23.02.2016	Basic anatomy of rodents (Recognize the anatomical structures) Histological analyses and labeling techniques to label and identify structures of different animal tissue Introducing animal models in preclinical investigation of new radiopharmaceuticals	Theory Prof. Luisa Ragioneri Dr.sci. Francesca Ravanetti Prof. Emilija Janevik	9.00 – 11.00 11.00 – 13.00 14.30 – 16.30	UI PET
24.02.2016	PET radioisotope production and radiopharmaceutical preparation - Quality Assurance; - Quality Management System; - Risk assessment PET Radiopharmaceutical Preparations (F-18/C-11/N-13) Quality control of PET Radiopharmaceutical Preparations (HPLC, GC, ITLC, pH, LAL)	Theory Dr.sci. Dmitry Soloviev Practice (group of 4 persons) Mr.pharm.Maja Velickovska Mr.sci. Saso Nikolovski	9.00 – 13.00 14.00 – 17.00	UI PET

	Calibration of the instruments (dose calibrator / alfa,beta,gama spectrometer)	Med.Phys. Zlatko Filipovski Mr.sci. Marija Atanasova Mr.sci. Katerina Kolevska Mr.sci. Filip Jolevski Mr.sci.chem. Maja Coceska		
WEEK 7 27.02-03.03.2016	TOPICS	ACTIVITIES	HOURS	PLACE
27.02.2016	Good Laboratory Practice	Theory / Discussion Prof. Biljana Gjorgeska	9.00 – 12.00	UI PET
	Radioisotope production and radiopharmaceutical preparation - reactor produced radioisotopes	Prof. Meera Venkatesh	13.30 – 16.00	
28.02.2016	Radiation Dosimetry in Nuclear Medicine	Theory / Practice Dr.sci. Marina Zdraveska Kocovska Mr.sci Saso Nikolovski Med.Phys. Zlatko Filipovski	9.00 – 13.00	UI PET
	Regulatory aspects - Radiation Safety Directorate	Representatives from Radiation Safety Directorate	14.00 – 16.00	
01.03.2016	Kit manufacturing for in-house, in-country and Global use	Theory Prof. Emilija Janevik	9.00 – 11.00	UI PET
	Freeze dried formulation of ready to use kit for diagnostic and therapeutical radiopharmaceuticals	Mr. David Mwanza Mr. Aschalew Alemu (Master students)	11.00 – 13.30	
	Validation and qualification in Radiopharmacy	Theory / Practice Prof. Emilija Janevik	14.00 – 17.00	

02.03.2016	Regulatory aspects of Radiopharmaceuticals Visit to the Agency of Drug of Republic of Macedonia – MALMED	Theory Dr. sci. Marija Darkovska Serafimovska	9.00 - 12.00 14.00 – 17.00	MALMED
03.03.2016	Electric Design and function HVAC, Technical gasses and plumbing installations	Theory Trajce Sazdov, B.S.Mech.Eng. Andreja Stefanovski, B.S.El.Eng. Practice (group of 11 persons) Trajce Sazdov, B.S.Mech.Eng. Andreja Stefanovski, B.S.El.Eng.	9.00 – 11.00 11.00 – 13.00 14.00 – 17.00	UI PET
WEEK 7 06-10.03.2016	TOPICS	ACTIVITIES	HOURS	PLACE
06.03.2016	Principle of GMP and facility design - Hospital Radiopharmacy - PET Radiopharmacy - Validation and qualification	Theory / Discussion Mr. Andrew Cockcroft	9.00 – 12.00 13.30 – 16.30	UI PET
07.03.2016	Oncology – basic terminology & pathophysiology of tumor metabolism Clinical application of PET Radiopharmaceuticals in oncology Clinical application of PET Radiopharmaceuticals in non-oncology diseases Clinical cases & Artefacts	Theory Dr. Meri Angeleska Practice (group of 11 persons) Dr. Meri Angeleska Dr. Jasmina Simjanovska Dr. Dusica Todorova Dr. Slavko Tasevski	9.00 – 12.30 13.30 – 16.30	UI PET

08.03.2016	New Methods for Routine Production of Technetium-99m by Medical Cyclotrons (Skype from Legnaro – Ferrara) Apllications od FDG and C11 choline & Scanning protocols	Licia Ucelli Alessandra Boschi Petra Martini Practice (group of 11 persons) Dr. Meri Angeleska Dr. Jasmina Simjanovska Dr. Dusica Todorova Dr. Slavko Tasevski	9.00 – 13.00 14.30 – 16.30	UI PET
09.03.2016	Radiopharmacy practice - Preparation of the cold ready to use kit for labeling Self-study Test, assessment	Practice Prof. E. Janevik Mr.sci. Marija Sterjova Mr.sci. P. Efremova	9.00 – 13.00 15.00 – 16.30	UGD
10.03.2016	Radiopharmacy practice - Preparation of the cold ready to use kit for labeling Certification and closing	Practice Prof. E. Janevik Mr.sci. Marija Sterjova Mr.sci. P. Efremova	9.00 – 13.00 14.30 – 16.30	UGD