Study plan

Name of study plan: Jaderné inženýrství - Aplikovaná fyzika ionizujícího zá ení

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Nuclear Engineering Type of study: Follow-up master full-time Required credits: 0 Elective courses credits: 120 Sum of credits in the plan: 120 Note on the plan:

Name of the block: Compulsory courses in the specialization Minimal number of credits of the block: 0 The role of the block: PS

Code of the group: NMSPJIAFIZ1 Name of the group: MDP P_JIN AFIZ 1st year Requirement credits in the group: Requirement courses in the group: In this group you have to complete at least 14 courses Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
16AMMN	Methods of Analytical Measurement Hana Pr šová Kate ina Pila ová Hana Pr šová (Gar.)	KZ	2	2P+0C	2	PS
16EX	Excursion Lenka Thinová Lenka Thinová (Gar.)	Z	3	1t		PS
16IDOZ	Integral Dosimetry Methods Iva Ambrožová Iva Ambrožová Ladislav Musílek (Gar.)	ZK	2	2+0	2	PS
16IZZP	Ionizing Radiation in the Environment Lenka Thinová, Tomáš echák, Václav Št pán Václav Št pán Václav Št pán (Gar.)	Z,ZK	3	2P+1C	1	PS
17JABE	Nuclear Safety Lenka Frýbortová, ubomír Sklenka Lenka Frýbortová Lenka Frýbortová (Gar.)	ZK	5	4P	z	PS
02KFM	Quantum Physics Filip Petrásek Petr Jizba Filip Petrásek (Gar.)	Z,ZK	3	2P+1C	Z	PS
16MCRF	Monte Carlo Method in Radiation Physics Tomáš Urban Tomáš Urban Tomáš Urban (Gar.)	Z,ZK	4	2+2	2	PS
16MERV	Instrumentation for Radiation Measurements Petr Pr ša Petr Pr ša Petr Pr ša (Gar.)	Z,ZK	4	2P+2C	1	PS
17PENF	Advanced Experimental Neutron Physics Ond ej Huml Ond ej Huml (Gar.)	KZ	4	1P+3L	L	PS
16PPJRF	Advanced Topics in Nuclear and Radiation Physics Ladislav Musílek Tomáš Urban Ladislav Musílek (Gar.)	Z,ZK	3	2P+1C	1	PS
16PDZNMS	Practicum in Detection and Dosimetry of Ionizing Radiation Petr Pr ša, Ji í Martin ík Petr Pr ša Petr Pr ša (Gar.)	KZ	4	0+4	Z	PS
16UMT	Accelerators in Medicine and Technology Kamil Augsten Kamil Augsten Kamil Augsten (Gar.)	KZ	1	1P+0C	1	PS
16VUJI1	Research Project 1 Tomáš Bílý Tomáš Trojek (Gar.)	Z	6	0+6	1	PS
16VUJI2	Research Project 2 Tomáš Trojek, Tomáš Bílý Tomáš Bílý Tomáš Trojek (Gar.)	КZ	8	0+8	2	PS

Characteristics of the courses of this group of Study Plan: Code=NMSPJIAFIZ1 Name=MDP P_JIN AFIZ 1st year

 16AMMN
 Methods of Analytical Measurement
 KZ
 2

 Principles, technical performance and utilization of methods of chemical analysis. Methodology of analytical determination, gravimetry, titration methods, potentiometry, polarography, refractometry, polarimetry, UV-VIS spectroscopy, atomic emission and absorption spectroscopy, infrared and Raman spectroscopy, X-ray structural analysis, nuclear magnetic and electron spin resonance, mass spectrometry, thermometric methods, gas and liquid chromatography.
 V-VIS
 V-VIS

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ftlDCV Integral Dosimetry Methods Z Z Integral bosimetry filts, thermoluminescent, adoptotulminescent, adoptotulminescent, and chemical disainetes, ruleas envirolus, additates track detectors, special neuron dosimeters (Si code, abedo dosimeters); advantages and disadvantages of different systems, secondary standardisation methods for dose measurements of a photos, electrons and neurons with respect to the use in personal and environs with respect to the use in personal and environs with respect to the use in personal and environs with respect to the use in personal and environs with respect to the use of noting radiation occurring in the environment. It includes information, methods of measuring, and calculating effective doses from holvicular success of tonicing radiation and discusses related radiation protection. Z/LX S TJABE Nuclear SCRIV Nuclear SCRIV S T Course proteins and spanses. During lactures are different by ear frequencies of defense in depth wayspects of operation of there ourses follows up used of operation of different types of respectives and lessons tearned from important events. S Bale description, were function, politations and different by ear frequencies and the accompation by PXR and adative spacets of operation of different by ear frequencies and the accompation by PXR and adative spacets of appearsion of reader in eaccire in the event in eaccire in eaccire in the event in eaccire in the event in	Excursion in research in	istitutes, laboratories and cooperative universities (CERN, JINR, IU Dresden,) and modern research trends usig ionizing r	adiation.	
Integrating sold attele dosimeters (time, thermoluminescent, contration, wowelection, yoluminescent, and chemical dosimeters). Autoceles remulation solution and the top does measurement of photons, determines (S dodd, allowed dosimeters). Autocellange and distance and the terminescent, and there is a control top and the measurement of photons, determinescent, and there is a control top and the source of lonking radiation of the Environment. In includes information, methods of measuring, and calculating effective does from individual sources of lonking radiation and the Environment. In includes information, methods of measuring, and calculating effective does from individual sources of lonking radiation and the top and the environment. In includes information, methods of measuring, and calculating effective does from individual sources of lonking radiation and the contrast of the source of lonking radiation and technic source and postabilitic safety assessment of nuclear facilities. New knowledge is connected with information effort and proceed sources for the advected bios up use of operation experimence and lessons learned form information effort and proceed sources are effective does accompression to provide registry assessment, and coldents with hose of coldents and and checken twice and checken the lonking and their comparison to PVR and safety assessment, honoremetary principle, quantration of angle superime, hydrogen and rest. The safety assessment, and coldents with a sources of the safety assessment, and coldents with a source of the safety assessment, and coldents with a source of the safety assessment on under a coldents, within source of providers, response of detective detective detective and the comparison to PVR and safety assessment, and response to response of the safety assessment, and the comparison to PVR and safety assessment, and the comparison to PVR and safety assessment, and and the toro and the comparison to prove the safety assessment, and the comparison to response of the safety asses	16IDOZ	Integral Dosimetry Methods	ZK	2
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ar prototes and networks win neglect other deal in personal and environmental desinanty. IDIZZP Ionizing Radiation in the Environment. Z.ZK 3 The outse provides a comprehensive view of the source of ionizing radiation occurring in the environment. It includes information, methods of measuring, and calculating effective does from individual sources of ionizing radiation and textus sees restand and during the environment. It includes information, methods of measuring, and calculating effective does from individual sources of ionizing radiation and duces see related radiation protection. 17.JABE Nuclear Safety ZK 5 The ourse gives information about basis requirements for safety assessment of nuclear facilities. New knowledge is connected with information get from other course focus with insoft contains, and proteins the protein the course gives and protein proteint exercise. ZZK 3 State description, wave function, postulates of quantum mechanics, Bon's statistical interpretation, expectation values, Schrödinger equation, Heisenberg uncertainty principle, quantization of angle systems, hydrogen atom. ZZK 4 Basic principles of the Cm ethod, protability flexcy and esteect concepts in mathematical statistical, lonsing radiation at values. Schrödinger equation, Heisenberg uncertainty principle, quantization of angle systems, hydrogen atom. ZZK 4 Basic principles of the Cm ethod, protability flexcy and esteed concepts in mathematical statistical, lonsing radiation of transport standation transport standation transport standation for theoret the proteins the standation for theoret transport of churged paratices. </td <td>track detectors, special r</td> <td>neutron dosimeters (Si diode, albedo dosimeters), advantages and disadvantages of different systems, secondary standardisati</td> <td>on methods for do</td> <td>se measurement</td>	track detectors, special r	neutron dosimeters (Si diode, albedo dosimeters), advantages and disadvantages of different systems, secondary standardisati	on methods for do	se measurement
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with loss of cobaint, and accounts with positive reactivity and critical ty, text part of the course fundows up bale of operation by pointing associal earther for important events. ZKK 3 The last part is following to compare the course fundows up bale of operation by pointing associal earther of the course fundows up bale of operation and easies in earther of the earth process. Z/K 3 State description, wave function, possibility of updation of simple systems, hydrogen atom. Z/K 4 Basic principles of the MC method, probability theory and selected concepts in mathematical statistics. Ionising radiation transport simulation, photons, neutrons and charged particles interactions and their simulation, modelling of the geometric conditions. Statistical tests of the model calculations, variance reduction techniques. Codes for simulation of radiation transport. MCNP(S) code, properties and score or usage, input If (description of the geometry, materials, sources, tallies), graphical tode, code is or simulation fields/beams/sources, spectra/bystati description of the description and statistics. Ionising radiation physics (shielding, radiation fields/beams/sources, spectra/bystati distributions of the transport of charged particles. 4 The lecture focuses on ionizing radiation detector signal processing by the program Fluka and Geometry, similaria and approaces in a physica as a comparison would by as a coperation for a statistical strategines. 2 4 The lecture focuses on ionizing radiation detector signal processing, by lang and processing by NMS standard detector inculta and NMS. The easies of working with the program Fluka and Geometry, tating as a comparison and skills.	reactor physics, reactor	thermomechanics and dynamics. During lectures are discussed principles of detence in depth, deterministic and probabilisti	c satety assessme	ent, accidents
The lest part is bodiesed of salary aspect of operation of unertent types of reactable and tent of unertents and y aspects of operation of research reactors. QUEXFM Quantum Physics Z,ZK 3 State description, wave function, postbultes of quantum mechanics, Born's statistical interpretation, expectation values, Schrödinger equation, Heisenberg uncertainty principle, quantization of angular momentum, solution of simple systems, hydrogen atom. Z,ZK 4 Basic principles of the KC method, modelling of the geometric conditions. Statistical tests of the model calculations, variance reduction techniques. Codes for simulation, of thoraged particles interactors and their simulation, modelling of the geometric conditions. Statistical tests of the model calculations, variance reduction techniques. Codes for simulation of tradactor of thoraged particles. Table EVEN MONTEC Station, Body Bullief): Examples of application to preciscal training concentrated on radiation physics (shift-debeams/sources, spectra/spatial distributions of the dosimetric quantities, responses of detection systems, radiation protection tasks. The basics of working with the program Fluka and Geant, SRM code for simulation of the transport of tharged particles. The lecture focuses on ionizing radiation detectors ingnal processing, and processing, and advanced leves a well. Absolowents should be able to design, bulla, operate and eacoustical appendix of durated area represende solution and advanced leves as well. Absolowents should be able to design, bulla, operate and eacoustical agnostical of simple electronic circuit made of NM standard modules. TPENF Advanced Experimental Neutron Physics ZZK 4 4 <td< td=""><td>With loss of coolant, and</td><td>a accidents with positive reactivity and criticality. Next part of the course follows up use of operation experiences and lessons d an anter appet of operation of different types of reactors and their comparison to DWP and eaferty expects of appretion of</td><td>learned from imp</td><td>ortant events.</td></td<>	With loss of coolant, and	a accidents with positive reactivity and criticality. Next part of the course follows up use of operation experiences and lessons d an anter appet of operation of different types of reactors and their comparison to DWP and eaferty expects of appretion of	learned from imp	ortant events.
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Identification of singlial momentum, sourced to springe systems, injurged nation. Identified	State description, wave	tunction, postulates of quantum mechanics, Born s statistical interpretation, expectation values, Schrödinger equation, Heis	enderg uncertaint	y principie,
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Basic principles of the MC method, probability theory and selected concepts in mathematical statistics. Joinsing flaation transport simulation, photons, neutrons and charged particles interactions and their simulation, modelling of the geometric conditions. Statistical calculations, variance reduction techniques. Codes for simulation of radiation transport, MCNP(X) code, properties and scope of usage, input file (description of the geometry, materials, sources, tailies), graphical tools, code user control. Tools for input fires certainvelding a visualization (VISED. Satina, Body Builder). Examples of application (practical training) concentrated on radiation physics (hielding, radiation fields/beams/sources, spectral/spatial distributions of the dosimetric quantities, responses of detection systems, radiation protection tasks. The basics of working with the program Fluka and Geant, SRM code tor simulation of radiate processing, data acquisition and spectrum deconvolution. Integral parts of the subject are several laboratory exercises. Thus, students are adults to total materiatical experimental nearcises are focused on detector signal processing by NIM standard electronic modules mostly. Students will learn how to operate an oscilloscope at advanced level as well. Absolvents should be able to design, build, operate and execute diagnostics of simple electronic circuit made of NIM standard modules. 17PENF Advanced Experimental Neutron Physics KZ 4 16PEJJF Advanced Topics in Nuclear and Radiation Physics elevation sources (D-D, D-T generators), properties of protoneutron sources, neutron oscimetry, using Bone spheres and scillations or and spectrum incending in the scheros and models, the interaction of oinzing radiation in advasing and mode. 17PENF Advanced Topics in Nuclear and Radiation Physics	16MCRF	Monte Carlo Method in Radiation Physics	Z,ZK	4
Interactions and their simulation, motening or the geometric condutions, statistical tests of the model calculations, variance reduction techniques. Codes for simulation of relation transport, MCNR() code, properties and scope of usage, input life (description of the geometry, materials, sources, tailles), graphical tools, code user control. Tools for input fines creation/vediting a visualization (VISED, Sabrina, Body Builder). Examples of application (practical training) concentrated on radiation physics (shielding, radiation fields/bearns/sources, spectra/spatial distributions of the dosimetric quantities, responses of detection systems, radiation protection tasks. The basics of working with the program Fluka and Geant, SRIM code for simulation of the transport of charged particles. The activation of the subject of spatial processing, data acquisition and data processing. Among others, the most important topics are: energetic spectrometry, since focuses on ionizing radiation detector signal processing. At a acquisition radical detector is mole focus sources are energetic spectrometry, sub-energical experimental Neutron Physics focused on detector signal processing by NIM standard detector circuit made of NIM standard modules. TPENF Advanced Experimental Neutron Physics Practical experimental Neutron Physics Practical experimental Neutron Physics Practical experimental neutron beam attenuation by various materials, acceleration based neutron sources (D-D, D-T generators), properties of photoneutron sources, neutron detection, determination on the site of the subject of the increation analysis, and more. 16PDRF Advanced Topics in Nuclear and Radiation Physics Program Nuclear Engineering at FNSPE CTU in Prague in subjects 16URF1 and 16URF2 or in similar courses at the invite of indiculty corresponding to the master's level of the increation and their control increation and one indication and exceltion, and exceltration on the physics of high energy particles. Particular attention is also paid to quantities cha	Basic principles of the N	//C method, probability theory and selected concepts in mathematical statistics. Ionising radiation transport simulation, photor	is, neutrons and c	harged particles
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16VUJI1 Research Project 1 Z 6 The research project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. 16VUJI2 Research Project 2 KZ 8 The research project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. KZ 8	medicine and technolog	y (industry), but also in basic research, with examples of such applications		
The research project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. 16VUJI2 Research Project 2 KZ 8 The research project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. KZ 8	16VUJI1	Research Project 1	Z	6
regular meetings and discussions. 16VUJI2 Research Project 2 KZ 8 The research project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions.	The research project is I	based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the	project supervisor	during common
16VUJI2 Research Project 2 KZ 8 The research project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions. KZ 8	regular meetings and di	scussions.		
The research project is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the project supervisor during common regular meetings and discussions.	16VUJI2	Research Project 2	KZ	8
regular meetings and discussions.	The research project is I	based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the	project supervisor	during common
	regular meetings and di	scussions.		-

Code of the group: NMSPJIAFIZ2

Name of the group: MDP P_JIN AFIZ 2nd year

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 11 courses

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
16AIZM	Medical Application of Ionizing Radiation Tereza Hanušová, Anna Jelínek Michaelidesová Tereza Hanušová Tereza Hanušová (Gar.)	Z,ZK	3	2+1	3	PS
16APIZ1	Applications of Ionizing Radiation 1 Tomáš echák, Tomáš Trojek, Václav Procházka Tomáš Trojek Tomáš echák (Gar.)	ZK	3	3P+0C	L	PS
17APIZ2	Application of Ionizing Radiation 2 Martin Cesnek, Marcel Miglierini, Milan Štefánik Milan Štefánik	Z,ZK	3	2P+1L	L	PS

ſ				r		
16DPJI1	Master Thesis 1 Jan Frýbort Tomáš Trojek (Gar.)	Z	10	0+10	3	PS
16DPJI2	Master Thesis 2 Jan Frýbort Tomáš Trojek (Gar.)	Z	20	0+20	4	PS
16MMM	Mathematical Methods and Modelling Tomáš Urban Jaroslav Kluso (Gar.)	Z	2	0+2	3	PS
16MEIZ	Metrology of Ionizing Radiation Pavel Novotný Pavel Novotný Tomáš Trojek (Gar.)	Z,ZK	4	2+1	Z	PS
16MDOZI	Microdosimetry Kate ina Pachnerová Brabcová Anna Jelínek Michaelidesová Kate ina Pachnerová Brabcová (Gar.)	KZ	2	2P+0C	Z	PS
16PFE	Overview of Elementary Particle Physics Jan Smolík Jan Smolík Jan Smolík (Gar.)	KZ	2	2P+0C	Z	PS
16SEM2	M2 Seminar 2 Kate ina Pila ová Kate ina Pila ová (Gar.) Z 2		0+2	L	PS	
16SPD	Spectrometry in Dosimetry Pavel Novotný Pavel Novotný Tomáš echák (Gar.)	ZK	2	2P+0C	Z	PS
Characteristics of the	courses of this group of Study Plan: Code=NMSPJIAFIZ2 Nan	ne=MDP P JI	N AFIZ 2	2nd vear		
	dical Application of Ionizing Radiation			7	7K	3
	alcal Application of ionicing radiation in modicing in diagnostic and intervention	al radiology puel	oor modicin	o and radiot		5
		iai Taulology, Tiucle				
16APIZ1 App	plications of Ionizing Radiation 1				2K	3
Applications of ionizing radiat	tion 1 inclusive of radioanalytical methods and application of radionuclides and ionizin	g radiation for and	alysis and d	iagnostics of	industrial a	and research
processes.						
17APIZ2 Apr	plication of Ionizing Radiation 2			Z	,ZK	3
The course provides overview	w of possibilities of the applications of ionizing radiation namely in the field of characte	riza-tion and diag	nostic of m	aterials for th	e sake of s	cience and
technology. Emphasis will be	given to advanced methods of materials characterization which utilize atomic and nuc	clear physical prod	cesses. Sev	eral diagnos	tic methods	based upon
ionizing radiation will be intro	duced.			0		
	ster Thesis 1				7	10
	an a tania approved by the administrators of the programme, department and by the d	oon. The student i	a guidad bu	the project of		
The diploma project is based	on a topic approved by the authinistrators of the programme, department and by the d	ean. The student i	s guided by	the projects	supervisor c	iuning common
regular meetings and discuss						
16DPJI2 Ma	ster Thesis 2				Z	20
The diploma project is based	on a topic approved by the administrators of the programme, department and by the d	ean. The student i	s guided by	the project s	supervisor c	luring common
regular meetings and discuss	sions.					
16MMM Ma	thematical Methods and Modelling				Z	2
Application of mathematical r	nethods, modelling and data processing in dosimetry, radiological physics, medicine a	and experimental	physics. Pro	cessing, and	alysis and e	valuation of
spectra (peak search and fitti	ng, deconvolution), data analysis, statistical processing and visualization (smoothing,	numerical differen	ntiation, cre	ation of histo	grams), mo	delling (Monte
Carlo method) and examples	of applications (calculation of the response of detection systems, efficiency and reso	lution, calculation	s of the and	ular energy	distributions	s of dosimetric
guantities in radiation fields/b	eams, measuring methods simulation/design). Demonstration/training of applications	of selected codes	Gnuplot.	ROOT. MCN	P. Vised. Sa	brina. Body
Builder, SRIM/TRIM, Geant).	,		X = -17	, -	,,	., .,
16MEIZ	trology of Ionizing Padiation			7	76	1
The course introduces studer	to to the metrology including its logislative framework. Fundamental and general conc	onts of the field (c	alibration v	orification lo		
instruments, measuring star	dards, measurement accuracy) are explained. Further, the methods of atomic and put	epts of the field (ca	alibration, v	mination (ad	ivity contro	
radiation exposure absorbed	(doea) are discussed in detail	ical physics qual			ivity, Source	, cimosion,
					/7	
	nouosimeu y			_ _	~~	
Basic characteristics of ionisi	ng radiation energy transfer to matter, importance of inelastic collisions of charged pa	rticles, excitation	runction, et	c. Irack and	cnaracterist	ics of ionising
particles, time evolution of the	e energy transfer process. Microdosimetry, basic principles and approaches, stochasti	c and non-stochas	suc quantitie	es, linear ene	ergy transfe	r, iineai energy,
specific energy. Experimental	and computational microdosimetry. Microdosimetry applied in radiobiology, radiation	protection, radioth	herapy.			
16PFE Ove	erview of Elementary Particle Physics				٨Z	2
In the modern particle physic	s experiments, there are specialists from other fields of science and engineering inclu	iding dosimetry. T	he aim of th	is lecture is	o provide a	in introduction
into problems of particle phys	sics and the terminology used there for students of dosimetry.					
16SEM2 Ser	minar 2				Z	2
An oral presentation of Maste	er's Thesis results. The presentation is evaluated by the other attendees of the semina	ry. The students a	are encoura	ged to write	an article s	ummarizing
their Master thesis.	· · ·			-		5
16SPD Snd	ectrometry in Dosimetry				7K	2
The course deals with mothe	ds and applications of ionizing radiation (i.e. photons, charged particles and poutrops)	Spectrometry Th	e moet imp	ortant types	of detectors	
components of the electronic	everam used in enectrometry as well as spectra analysis procedures are discussed in	, spectrometry. In a detail	o most imp	ontaint types		, muividual
	ישטוניוו עשבע ווו שבטוטווובווץ מש אבוו מש שבנוום מוומוששה אוטנבעעובש מופ עושנעשש מש					

Name of the block: Elective courses Minimal number of credits of the block: 0 The role of the block: V

Code of the group: NMSPJIAFIZV Name of the group: MDP P_JIN AFIZ Optional courses Requirement credits in the group: Requirement courses in the group: Credits in the group: 0 Note on the group:

	Name of the course / Name of the group of courses					
Code	(in case of groups of courses the list of codes of their	Completion	Credits	Scope	Semester	Role
	members)					
	Digital Image Processing	7K	4	2P+2C		V
	Barbara Zitová Barbara Zitová Barbara Zitová (Gar.)		-	21 +20		V
16DNEU	Michal Koš ál, Ond ej Ploc Ond ej Ploc Ond ej Ploc (Gar.)	ZK	2	2+0	3	V
16DZAR	Ladislav Musílek Ladislav Musílek Ladislav Musílek (Gar.)	ZK	2	2+0	4	V
16KLD2	Clinical Dosimetry 2 Tereza Hanušová, Tomáš Trojek, Josef Novotný Tereza Hanušová Tereza Hanušová (Gar.)	ZK	2	2P+0C	z	V
16KPD	Design of Ionizing Radiation Semiconductor Detectors Martin Kákona (Gar.)	Z	3	0+3	L	V
04MGA1	English for Academic Purposes Speaking Practice - intermediate Darren Copeland Darren Copeland (Gar.)	Z	2	0+2	L,Z	V
04MGA2	Academic English Writing and Presentation Course - intermadiate Darren Copeland (Gar.)	Z	2	0+2	L,Z	V
18MEMC	Monte Carlo Method Jaromír Kukal, Miroslav Virius Miroslav Virius (Gar.)	Z,ZK	4	2P+2C	Z	V
16PDIZ	Practicum in Dosimetry of Ionizing Radiation Václav Št pán Václav Št pán Václav Št pán (Gar.)	KZ	4	0+4	L	V
16REL	Radiation Effects in Matter Kate ina Pila ová Kate ina Pila ová Kate ina Pila ová (Gar.)	ZK	2	2+0	Z	V
16RAO	Radiation Protection Ji í Martin ík, Tomáš Trojek, Darina Trojková, Ji í H Ika, Ladislav Tomášek Tomáš Trojek Tomáš Trojek (Gar.)	ZK	4	4+0	1	V
16RBIO	Radiobiology Marie Davídková Marie Davídková (Gar.)	ZK	2	2+0	L	V
01SUP	Start-up Project Pemysl Rubeš Pemysl Rubeš Pemysl Rubeš (Gar)	КZ	2	2P+0C		V
01SU1	Machine Learning 1 Jan Flusser Jan Flusser Jan Flusser (Gar)	ZK	3	2P+1C		V
16FSC	Fundamentals of Physics of Scintillators and Phosphors Martin Nikl Martin Nikl Martin Nikl (Gar.)	ZK	2	2+0	L	V
16ZKLD	Basics of Clinical Dosimetry Tereza Hanušová, Tomáš Trojek, Josef Novotný Tereza Hanušová Tomáš echák (Gar.)	ZK	2	2P+0C		V
Characteristics of the	courses of this group of Study Plan: Code=NMSPJIAFIZV Nar	ne=MDP P J	IN AFIZ (Optional	courses	
01DIZO Dic	01DIZO Digital Image Processing ZK 4					
image sampling and quantization frequency domains, convolut	ation, Shannon theorem, aliasing basic image operations, histogram, contrast stretchir ion, Fourier transform edge detection, corner detection feature detection image degra	ng, noise removal, dations and their	image shar modelling, ir	pening linea	ar filtering in th Wiener filtering	e spatial and g, restoration
of motion-blurred and out-of-	focus blurred images image segmentation mathematical morphology image registration	on and matching				
16DNEU Ne	utron Dosimetry				ZK	2
Methods based on nuclear re	eactions with neutrons, methods based on recoiled nuclei, the time-of-flight method, ne	eutron selectors a	nd monochr	omators, ac	tivation metho	ods, methods
of integrating neutron dosime	etry, possibilities of use of various methods, calibration of neutron dosimeters and other	er dose and dose	rate measu	ing instrum	ents.	
16DZAR Do	simetry of Internal Radiation Sources				ZK	2
Assessment of the radiation	burden during internal contamination by radioactive materials, dosimetric quantities, c	compartment mod	els of the kir	netics of rac	lioactive mater	ials, ways of
medicine - basic concepts, g	eneral procedure for calculating the absorbed dose from radiopharmaceuticals, finding	data about the bi	ological beh	aviour of ra	diopharmaceu	iticals, tables
of absorbed doses and limita	tion of their validity, radiation burden for children, burden from contaminants in radiop	, harmaceuticals, d	evelopment	of methods	for assessme	nt of the
radiation burden from interna	al sources, methods of measurement of internal contamination, detection in-vivo, excre	eta monitoring, mo	onitoring of v	workplaces.		
16KLD2 Clir	nical Dosimetry 2				ZK	2
Learning outcomes of the con	urse unit The aim of the course is to acquaint students with advanced dosimetric meth	ods in accordance	e with the ra	pid develop	ment of techno	ologies in the
	sign of Ionizing Radiation Semiconductor Detectors	deepen ineoretic	ai kilowieug		7	3
Klí ová slova:: detectors, Ga	iger mode, A/D convertor			 	2	5
04MGA1 Eng Optional course offers Maste	glish for Academic Purposes Speaking Practice - intermediate r´s Degree students at intermediate level of English a chance to improve, develop, an	d strengthen their	vocabulary	and speaki	Z ng skills. Cour	2 se syllabus
will respond to specific profes	ssional interests and situations of students and choice of topics will be agreed on with	tutor. Course is a	non-gradeo	assessme	nt course.	
04MGA2 Aca Optional course, a possible f	ademic English Writing and Presentation Course - intermadiate ree sequel to course 04MGA1, offers Master's degree students at intermediate level c	of English a chanc	e to develop), improve, a	Z and strengther	2 their writing
and presentation skills. Syllal	bus will respond to specific professional needs of participants, but will include also write	ting and preparing	g a presenta	ition on owr	research topi	c, a search,
instruction on writing Master	thesis in English and presenting chosen facts. Course will thus prepare students for p	resentations at co	onferences.	Course is a	non-graded as	ssessment
18MEMC Mo	nte Carlo Method			Z	Z,ZK	4
This course is devoted to the	numerical method Monte Carlo and to its selected applications.			1	K2	Α
The curriculum comprises co	acticum in Dosimetry of ionizing Kadiation illection of the most important exercises in Dosimetry. It enables student?s familiarizat	ion with physical	parameters	and constar	nts. supports o	4 competency
in measuring dosimetric para	ameters and provides information concerning preferred methods for ionizing radiation	measurement res	ults process	ing. It is a to	col for introduc	cing students
to the practical aspects of sci	ientific research work. The duration of each single task is 4 hours, followed by results	processing. Work	protocol is r	ot required	, however wha	t is expected
is active participation in select	ction of alternative solution methods, requiring complex application of theoretical know	/ledge.				

	Dediction Effects in Mether	71/	0		
	Radiation Effects in Matter		<u>ک</u>		
History of radiolysis, track, stages of radiolysis, reaction kinetics, radiation chemical yield, experiments in radiolysis, classical methods, pulse radiolysis, EPR, primary products of					
radiolysis, excited state	s, solvated electrons, free radicals, radiolysis of gases, water, water solutions, organic induids, radiolysis of solid materials, for	nic crystals, polyrr	iers, glasses,		
metals and alloys, radia	tion technology, sterilisation, crosslinking and degradation of polymers, treatment of roods.				
16RAO	Radiation Protection	ZK	4		
The aim of the subject is	to provide a self-contained overview of the radiation protection with a special focus on general principles. The subject is based or	n the actual ICRP r	ecommendation		
no. 103 and other docu	nents, which specifies radiation protection in the Czech Republic and EU. The course is accepted as training, which allows of	btaining special c	ompetence in		
radiation protection. Par	ticipants will receive an appropriate certificate of attendance when fulfil all requirements defined in the permit of SONS.				
16RBIO	Radiobiology	ZK	2		
The presented lectures	are aimed at basis of radiation biology. Students are introduced into biological effects of ionizing radiation; physical and cher	nical processes of	radiation action		
in biological material; m	echanisms of radiation damage to DNA and other cell components; types of damages and their repair; subcellular and cellula	ar sensitivity and I	esponse to		
irradiation; physical, bio	ogical and chemical modificators of the cell response to irradiation; theories and models for cell survival and radiation biolog	y of normal and n	eoplastic tissue		
systems.					
01SUP	Start-up Project	KZ	2		
01SU1	Machine Learning 1	ZK	3		
[1] features for description	on and recognition of 2-D shapes [2] invariant features, Fourier descriptors, moment invariants, differential invariants [3] statistic	cal pattern recogn	ition, supervised		
and nonsupervised clas	sification, NN- classifier, linear classifier, Bayessian classifier [4] clustering in a feature space, iterative and hierarchical meth	ods [5] dimensior	ality reduction		
of a feature space					
16FSC	Fundamentals of Physics of Scintillators and Phosphors	ZK	2		
Electronic band structure of solids, interaction of X gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forbidden gap L uninescence centers.					
Electronic band structur	e of solids, interaction of X, gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forb	idden gap. Lumin	escence centers		
Electronic band structur and traps for charge car	e of solids, interaction of X, gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forb iers. Absorption and luminescence processes, energy transfer, quenching. History of scintillator and phosphor development. Ma	idden gap. Lumin	escence centers and parameters.		
Electronic band structur and traps for charge car Technology basics. Exa	e of solids, interaction of X, gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forc iers. Absorption and luminescence processes, energy transfer, quenching. History of scintillator and phosphor development. Ma mples of applications.	idden gap. Lumin ain characteristics	escence centers and parameters.		
Electronic band structur and traps for charge car Technology basics. Exa 16ZKLD	e of solids, interaction of X, gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forc iers. Absorption and luminescence processes, energy transfer, quenching. History of scintillator and phosphor development. Ma mples of applications. Basics of Clinical Dosimetry	idden gap. Lumin in characteristics ZK	escence centers and parameters.		
Electronic band structur and traps for charge car Technology basics. Exa 16ZKLD Specific requirements for	e of solids, interaction of X, gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forc iers. Absorption and luminescence processes, energy transfer, quenching. History of scintillator and phosphor development. Ma mples of applications. Basics of Clinical Dosimetry r radiation beam dosimetry as well as radiation protection aspects will be discussed for clinically used beams. Absolute and relations	idden gap. Lumin ain characteristics ZK ative dosimetry m	escence centers and parameters. 2 ethods including		
Electronic band structur and traps for charge car Technology basics. Exa 16ZKLD Specific requirements for instrumentation and in-v	e of solids, interaction of X, gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forc iers. Absorption and luminescence processes, energy transfer, quenching. History of scintillator and phosphor development. Ma mples of applications. Basics of Clinical Dosimetry r radiation beam dosimetry as well as radiation protection aspects will be discussed for clinically used beams. Absolute and rel- ivo dosimetry technology and their possibilities and limitations in clinical dosimetry will be analysed. Optimisation and minimiz	idden gap. Lumin in characteristics ZK ative dosimetry m ation of absorbed	escence centers and parameters. 2 ethods including dose from X-ray		
Electronic band structur and traps for charge car Technology basics. Exa 16ZKLD Specific requirements for instrumentation and in-v examinations, dose det	e of solids, interaction of X, gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forc iers. Absorption and luminescence processes, energy transfer, quenching. History of scintillator and phosphor development. Ma mples of applications. Basics of Clinical Dosimetry r radiation beam dosimetry as well as radiation protection aspects will be discussed for clinically used beams. Absolute and rel- ivo dosimetry technology and their possibilities and limitations in clinical dosimetry will be analysed. Optimisation and minimiz rrmination based on activity of applied radiopharmaceutical.	idden gap. Lumin in characteristics ZK ative dosimetry m ation of absorbed	escence centers and parameters. 2 ethods including dose from X-ray		

List of courses of this pass:

Code	Name of the course	Completion	Credits
01DIZO	Digital Image Processing	ZK	4
image sampling an	d quantization, Shannon theorem, aliasing basic image operations, histogram, contrast stretching, noise removal, image sharpening l	inear filtering in the	spatial and
frequency domains	, convolution, Fourier transform edge detection, corner detection feature detection image degradations and their modelling, inverse a	nd Wiener filtering	, restoration
	of motion-blurred and out-of-focus blurred images image segmentation mathematical morphology image registration and mate	ching	
01SU1	Machine Learning 1	ZK	3
[1] features for desc	ription and recognition of 2-D shapes [2] invariant features, Fourier descriptors, moment invariants, differential invariants [3] statistical	pattern recognition	supervised
and nonsupervise	d classification, NN- classifier, linear classifier, Bayessian classifier [4] clustering in a feature space, iterative and hierarchical method	ls [5] dimensionalit	y reduction
	of a feature space		
01SUP	Start-up Project	KZ	2
02KFM	Quantum Physics	Z,ZK	3
State description	n, wave function, postulates of quantum mechanics, Born's statistical interpretation, expectation values, Schrödinger equation, Heise	nberg uncertainty	principle,
	quantization of angular momentum, solution of simple systems, hydrogen atom.		
04MGA1	English for Academic Purposes Speaking Practice - intermediate	Z	2
Optional course of	fers Master's Degree students at intermediate level of English a chance to improve, develop, and strengthen their vocabulary and sp	eaking skills. Cour	se syllabus
will respon	d to specific professional interests and situations of students and choice of topics will be agreed on with tutor. Course is a non-grade	d assessment cou	rse.
04MGA2	Academic English Writing and Presentation Course - intermadiate	Z	2
Optional course, a	possible free sequel to course 04MGA1, offers Master's degree students at intermediate level of English a chance to develop, improv	ve, and strengthen	their writing
and presentation s	kills. Syllabus will respond to specific professional needs of participants, but will include also writing and preparing a presentation on	own research topi	c, a search,
instruction on writi	ng Master thesis in English and presenting chosen facts. Course will thus prepare students for presentations at conferences. Course	is a non-graded a	ssessment
	COURSE.		
16AIZM	Medical Application of Ionizing Radiation	Z,ZK	3
The lectur	es aim at medical physics in applications of ionising radiation in medicine - in diagnostic and interventional radiology, nuclear medici	ne, and radiothera	oy.
16AMMN	Methods of Analytical Measurement	KZ	2
Principles, technica	al performance and utilization of methods of chemical analysis. Methodology of analytical determination, gravimetry, titration methods	s, potentiometry, po	olarography,
refractometry, pol	arimetry, UV-VIS spectroscopy, atomic emission and absorption spectroscopy, infrared and Raman spectroscopy, X-ray structural an	alysis, nuclear mag	gnetic and
	electron spin resonance, mass spectrometry, thermometric methods, gas and liquid chromatography.		
16APIZ1	Applications of Ionizing Radiation 1	ZK	3
Applications of ion	izing radiation 1 inclusive of radioanalytical methods and application of radionuclides and ionizing radiation for analysis and diagnos	tics of industrial an	d research
	processes.		
16DNEU	Neutron Dosimetry	ZK	2
Methods based on	nuclear reactions with neutrons, methods based on recoiled nuclei, the time-of-flight method, neutron selectors and monochromators	s, activation methor	ds, methods
of integr	ating neutron dosimetry, possibilities of use of various methods, calibration of neutron dosimeters and other dose and dose rate mea	suring instruments	i.
16DPJI1	Master Thesis 1	Z	10
The diploma projec	t is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the proj	ect supervisor duri	ng common
	regular meetings and discussions.		

16DPJI2	Master Thesis 2	Z	20
The diploma projec	t is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the proj regular meetings and discussions.	ect supervisor duri	ng common
16DZAR	Dosimetry of Internal Radiation Sources	ZK	2
Assessment of the	radiation burden during internal contamination by radioactive materials, dosimetric quantities, compartment models of the kinetics of	radioactive materi	als, ways of
taking into account	age dependence in dosimetric models, limitation of validity of used models and procedures, assessment of the radiation burden from ra	diopharmaceutical	ls in nuclear
medicine - basic co	oncepts, general procedure for calculating the absorbed dose from radiopharmaceuticals, finding data about the biological behaviour o	f radiopharmaceut	icals, tables
of absorbed dos radia	es and limitation of their validity, radiation burden for children, burden from contaminants in radiopharmaceuticals, development of me tion burden from internal sources, methods of measurement of internal contamination, detection in-vivo, excreta monitoring, monitorir	thods for assessming of workplaces.	ent of the
16EX	Excursion	Z	3
Excur	sion in research institutes, laboratories and cooperative universities (CERN, JINR, TU Dresden,) and modern research trends usig	onizing radiation.	
16FSC	Fundamentals of Physics of Scintillators and Phosphors	ZK	2
Electronic band str	ucture of solids, interaction of X, gamma and beta rays and particle beams with solids, principle of scintillation. Energy levels in forbidd	en gap. Luminesce	nce centers
and traps for charg	e carriers. Absorption and luminescence processes, energy transfer, quenching. History of scintillator and phosphor development. Main c Technology basics. Examples of applications.	haracteristics and p	parameters.
16IDOZ	Integral Dosimetry Methods	ZK	2
Integrating solid sta	ate dosimeters (films, thermoluminescent, radiophotoluminescent, colorization, exoelectron, lyoluminescent, and chemical dosimeters	, nuclear emulsion)	, solid state
track detectors, spe	ecial neutron dosimeters (Si diode, albedo dosimeters), advantages and disadvantages of different systems, secondary standardisation n	hethods for dose me	easurement
401770	or photons, electrons and neutrons with respect to their use in personal and environmental dosimetry.	771	2
	IONIZING RADIATION IN THE ENVIRONMENT	Z,ZK	3 a offective
	doses from individual sources of ionizing radiation and discusses related radiation protection	ing, and calculatin	g ellective
16KLD2		7K	2
Learning outcomes	s of the course unit The aim of the course is to acquaint students with advanced dosimetric methods in accordance with the rapid deve	 opment of technol	\sim
field: sm	all field dosimetry, dosimetry in magnetic field, proton beams, special technologies. Furthermore, it should deepen theoretical knowle	dge (cavity theory)).
16KPD	Design of Ionizing Radiation Semiconductor Detectors	7	3
	Klí ová slova:: detectors, Gaiger mode, A/D convertor	- 1	Ū
16MCRF	Monte Carlo Method in Radiation Physics	Z.ZK	4
Basic principles of	the MC method, probability theory and selected concepts in mathematical statistics. Ionising radiation transport simulation, photons, n	eutrons and charg	ed particles
interactions and	their simulation, modelling of the geometric conditions. Statistical tests of the model calculations, variance reduction techniques. Code	es for simulation of	radiation
transport, MCNP	(X) code, properties and scope of usage, input file (description of the geometry, materials, sources, tallies), graphical tools, code use	r control. Tools for i	nput fines
creation/editing a v	visualization (VISED, Sabrina, Body Builder). Examples of application (practical training) concentrated on radiation physics (shielding, r	adiation fields/bear	ms/sources,
spectral/spatial di	stributions of the dosimetric quantities, responses of detection systems, radiation protection tasks. The basics of working with the pro-	gram Fluka and Ge	eant, SRIM
	code for simulation of the transport of charged particles.		
16MDOZI	Microdosimetry	KZ	2
Basic characterist	ics of ionising radiation energy transfer to matter, importance of inelastic collisions of charged particles, excitation function, etc. Irack	and characteristics	
	specific energy transier process. Microdosimetry, basic principles and approaches, stochastic and non-stochastic quantities, intear specific energy Experimental and computational microdosimetry Microdosimetry applied in radiobiology, radiation protection, radio	otherany	ieai energy,
16MEIZ	Metrology of Ionizing Radiation	7 7K	4
The course introdu	ces students to the metrology, including its legislative framework. Fundamental and general concepts of the field (calibration, verificatio	n. legally controllec	d measuring
instruments, mea	asuring standards, measurement accuracy) are explained. Further, the methods of atomic and nuclear physics quantities determination	on (activity, source	emission,
	radiation exposure, absorbed dose) are discussed in detail.		
16MERV	Instrumentation for Radiation Measurements	Z,ZK	4
The lecture focuse	es on ionizing radiation detector signal processing, data acquisition and data processing. Among others, the most important topics are	energetic spectro	metry, time
spectrometry, coir	ncidence measurements, pulse shape discrimination and spectrum deconvolution. Integral parts of the subject are several laboratory	exercises. Thus, st	udents are
able to obtain prac	ctical experience and skills. The exercises are focused on detector signal processing by NIM standard electronic modules mostly. Stud	ents will learn how	to operate
an oscilloscope a	at advanced level as well. Absolvents should be able to design, build, operate and execute diagnostics of simple electronic circuit mac	e of NIM standard	modules.
16MIMM	Mathematical Methods and Modelling		2 aluation of
Application of ma	anematical methods, modelling and data processing in dosimetry, radiological physics, medicine and experimental physics. Processing and visualization (smoothing, numerical differentiation, creation of	g, analysis and eva	lling (Monte
Carlo method) and	t examples of applications (calculation of the response of detection systems, efficiency and resolution, calculations of the angular energy and resolution.	aray distributions of	f dosimetric
quantities in radia	ation fields/beams, measuring methods simulation/design). Demonstration/training of applications of selected codes (Gnuplot, ROOT,	MCNP, Vised, Sab	rina, Body
	Builder,SRIM/TRIM, Geant).		, ,
16PDIZ	Practicum in Dosimetry of Ionizing Radiation	KZ	4
The curriculum co	mprises collection of the most important exercises in Dosimetry. It enables student?s familiarization with physical parameters and cor	istants, supports c	ompetency
in measuring dosir	netric parameters and provides information concerning preferred methods for ionizing radiation measurement results processing. It is	a tool for introduci	ng students
to the practical asp	pects of scientific research work. The duration of each single task is 4 hours, followed by results processing. Work protocol is not requi	red, however what	is expected
	is active participation in selection of alternative solution methods, requiring complex application of theoretical knowledge.	·	
16PDZNMS	Practicum in Detection and Dosimetry of Ionizing Radiation	KZ	4
Subject consists	or practical exercises. They should learn students to operate nuclear instrumentation common in praxis, and also to do measurement	s, which may be pa	art of their
	iuluie jous.	47	0
	UVELIVIEW OF LIETHETHALLY MALLICE MINUS		
	into problems of particle physics and the terminology used there for students of dosimetry	o io to provide all l	
	Advanced Tonics in Nuclear and Radiation Physics	7 7K	3
The course extend	s and complements the knowledge acquired in the bachelor's program Nuclear Engineering at FNSPE CTU in Prague in subjects 16	ا جرجہ ہے۔ IRF1 and 16URF2	or in similar
courses at other ur	niversity. Therefore, it deals with the level of difficulty corresponding to the master's level of the issue of atomic nuclei, their characterist	ics and models, the	e interaction
of ionizing radiation	n with matter, radioactivity and nuclear reactions, and provides basic information on the physics of high energy particles. Particular atte	ention is also paid t	o quantities
	characterizing the field and interaction of ionizing radiation in accordance with current international recommendations.		

16RAO	Radiation Protection	ZK	4			
The aim of the subj	ct is to provide a self-contained overview of the radiation protection with a special focus on general principles. The subject is based on the	actual ICRP recon	nmendation			
no. 103 and other documents, which specifies radiation protection in the Czech Republic and EU. The course is accepted as training, which allows obtaining special competence in						
	radiation protection. Participants will receive an appropriate certificate of attendance when fulfil all requirements defined in the permi	t of SONS.				
16RBIO	Radiobiology	ZK	2			
The presented lect	ures are aimed at basis of radiation biology. Students are introduced into biological effects of ionizing radiation; physical and chemica	I processes of radia	ation action			
in biological material; mechanisms of radiation damage to DNA and other cell components; types of damages and their repair; subcellular and cellular sensitivity and response to						
irradiation; physica	I, biological and chemical modificators of the cell response to irradiation; theories and models for cell survival and radiation biology of	normal and neopla	astic tissue			
	systems.					
16REL	Radiation Effects in Matter	ZK	2			
History of radioly	sis, track, stages of radiolysis, reaction kinetics, radiation chemical yield, experiments in radiolysis, classical methods, pulse radiolysi	s, EPR, primary pro	oducts of			
radiolysis, excited	I states, solvated electrons, free radicals, radiolysis of gases, water, water solutions, organic liquids, radiolysis of solid materials, ionic	crystals, polymers	, glasses,			
	metals and alloys, radiation technology, sterilisation, crosslinking and degradation of polymers, treatment of foods.					
16SEM2	Seminar 2	Z	2			
An oral presentat	on of Master's Thesis results. The presentation is evaluated by the other attendees of the seminary. The students are encouraged to	write an article sun	nmarizing			
	their Master thesis.					
16SPD	Spectrometry in Dosimetry	ZK	2			
The course deals	with methods and applications of ionizing radiation (i.e. photons, charged particles and neutrons) spectrometry. The most important	types of detectors,	individual			
	components of the electronic system used in spectrometry as well as spectra analysis procedures are discussed in detail.					
16UMT	Accelerators in Medicine and Technology	KZ	1			
Introduction to acce	lerators, their history and classification, and description of accelerators parameters. Description of ion sources, all types of linear acceler	rators (electro-static	c, induction,			
oscillating fields)	circular accelerators (induction, oscillating fields, synchrotrons) and technologies connected to accelerators. The focus lies accelerat	ors applications, fo	remost in			
	medicine and technology (industry), but also in basic research, with examples of such applications					
16VUJI1	Research Project 1	Z	6			
The research proje	t is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the proj	ect supervisor durir	ng common			
	regular meetings and discussions.					
16VUJI2	Research Project 2	KZ	8			
The research proje	t is based on a topic approved by the administrators of the programme, department and by the dean. The student is guided by the pro	ect supervisor durir	ng common			
	regular meetings and discussions.		-			
16ZKLD	Basics of Clinical Dosimetry	ZK	2			
Specific requireme	In this for radiation beam dosimetry as well as radiation protection aspects will be discussed for clinically used beams. Absolute and relative	e dosimetry method	ds including			
instrumentation an	d in-vivo dosimetry technology and their possibilities and limitations in clinical dosimetry will be analysed. Optimisation and minimizatio	n of absorbed dose	e from X-ray			
	examinations, dose determination based on activity of applied radiopharmaceutical.		,			
17APIZ2	Application of Ionizing Radiation 2	Z.ZK	3			
The course provi	des overview of possibilities of the applications of ionizing radiation namely in the field of characteriza-tion and diagnostic of material	s for the sake of sci	ience and			
technology Emph	asis will be given to advanced methods of materials characterization which utilize atomic and nuclear physical processes. Several dia	gnostic methods ba	ased upon			
	ionizing radiation will be introduced.	•				
17JABE	Nuclear Safety	ZK	5			
The course gives	information about basic requirements for safety assessment of nuclear facilities. New knowledge is connected with information get fro	m other courses fo	cussed on			
reactor physics. r	sactor thermomechanics and dynamics. During lectures are discussed principles of defence in depth. deterministic and probabilistic s	afetv assessment.	accidents			
with loss of coola	nt. and accidents with positive reactivity and criticality. Next part of the course follows up use of operation experiences and lessons le	arned from importa	ant events.			
The last pa	rt is focussed on safety aspect of operation of different types of reactors and their comparison to PWR and safety aspects of operatio	n of research react	ors.			
17PENE	Advanced Experimental Neutron Physics	K7	4			
Practical exercises	with non-reactor neutron sources, neutron detection, determination of basic properties of radionuclide neutron sources (AmBe, Cf25)	2), neutron spectror	metrv usina			
Boner spheres and	scintillation detectors, neutron beam attenuation by various materials, acceleration based neutron sources (D-D, D-T generators) properties	erties of photoneutro	on sources			
	neutron dosimetry, neutron activation analysis. and more.	in the protonound				
18MEMC	Monte Carlo Method	7 7K	4			
	This course is devoted to the numerical method Monte Carlo and to its selected applications.	_,_,`				
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For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2025-08-25, time 10:17.