Study plan

Name of study plan: Vy azování jaderných za ízení z provozu

Faculty/Institute/Others: Department: Branch of study guaranteed by the department: Welcome page Garantor of the study branch: Program of study: Decommissioning of Nuclear Facilities 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 program Minimal number of credits of the block: 0 The role of the block: P

Code of the group: NMSPVJZP1 Name of the group: MDP P_VJZPN 1st year Requirement credits in the group: Requirement courses in the group: In this group you have to complete at least 15 courses Credits in the group: 0

Note on the group: Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their Completion Credits Code Scope Semester Role members) Tutors, authors and guarantors (gar.) Chemistry of Problematic Radionuclides 15CHPR 7K 2 2+0L Р Mojmír N mec Mojmír N mec (Gar.) Excursion 4 Ζ 2 1XT L 16EXK4 Ρ Lenka Thinová Lenka Thinová (Gar.) **Contamination and Methods of Decontamination 1** 2 2P Ζ 15KMD1 7K Р Kate ina ubová, Miroslava Semelová Miroslava Semelová Kate ina ubová (Gar.) **Contamination and Methods of Decontamination 2** 15KMD2 3 3P L 7K Р ubová, Miroslava Semelová Miroslava Semelová Kate ina ubová Kate ina (Gar.) Laboratory Exercises 1 15LAC1 ΚZ 4 L 5L Р Mojmír N mec, Kate ina ubová, Miroslava Semelová Mojmír N mec Miroslava Semelová (Gar.) Monte Carlo Method in Radiation Physics 2 16MCRF Z,ZK 4 2+2Р Tomáš Urban Tomáš Urban Tomáš Urban (Gar.) **Radioactive Waste and Spent Nuclear Fuel Management 1** 15NRO1 ΖK 3 3P Ζ Ρ Kate ina ubová, Evžen Losa Evžen Losa Kate ina ubová (Gar.) **Fuel Cycle of Nuclear Facilities** 17PCJZ ΖK 2 2P L Р Evžen Losa, ubomír Sklenka, Radovan Starý ubomír Sklenka ubomír Sklenka (Gar.) Chemistry Programme of Nuclear Power Plants 15PCJE 3 3P L Z,ZK Р Barbora Drtinová Barbora Drtinová Barbora Drtinová (Gar.) Structures and Properties of Materials 2P+1C 14SAVM ΖK 3 Р Hynek Lauschmann Hynek Lauschmann Hynek Lauschmann (Gar.) Nuclear Facilities Decommissioning 16VJZ Z,ZK 4 3P+1C Ζ Ρ Lenka Thinová, Ond ej Ko istka Tomáš Trojek (Gar.) **Research Project 1** 17VUV1 7 7 6 0P+6C Р Dušan Kobylka Dušan Kobylka Dušan Kobylka (Gar.) **Research Project 2** 17VUV2 8 0P+8C L ΚZ Ρ Dušan Kobylka Dušan Kobylka Dušan Kobylka (Gar.) **Equipment of Nuclear Power Plants** 17ZAJE 3 Ζ ΖK 3P Ρ Dušan Kobylka Dušan Kobylka Dušan Kobylka (Gar.) **Data Processing - Prognoses and Risk Assessment** Ζ 16RISK Z,ZK 5 3P+2C Ρ Kate ina Pila ová, Václav Št pán Kate ina Pila ová Kate ina Pila ová (Gar.)

Characteristics of the courses of this group of Study Plan: Code=NMSPVJZP1 Name=MDP P_VJZPN 1st year

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The course focuses on properties, chemical behaviour, speciation, and origin of radionuclides, which are considered to be problematic for their behaviour in radioactive wast	e or for
the determination of their activity. The radionuclides monitored in the radioactive waste repositories are of the main interest. For these radionuclides, various separation and mea	surement
methods needed for their determination in common matrices will be discussed. Determination and use of correlation factors will be explained as well as the reasons and consider the legal estivity limits of the reasons the reasons and consider the legal estivity limits of the reasons and consider	equences
DEXR4 EXCURSION 4	∠ vo will bo
Excusion is locused on enhancing skills in the use of decontamination methods, work with registration and waste management and it lakes several days. Part of the excusion a visit to one of the repositories in the Czech Republic (Richard). Decontamination techniques will be tested in a special ball in SUICHRO visit. Kamenná-Milín The decomp	
of workplaces after the mining of radioactive minerals will be demonstrated in the T/III DIAMO s. Stráž pod Ralskem There will also be demonstrated in situ measurement te	chniques
used to assess the remedial work, and their calibration. In cooperation with the SONS will be possible insight into the work of the emergency centers, verification of internal ei	mergency
plans, and the legislative framework for emergencies.	- 37
15KMD1 Contamination and Methods of Decontamination 1 ZK	2
The course is focused on the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the future trends in this fie	ld. Part of
the lectures is aimed at radioactive contamination with the emphasis corrosion products. Various methods of decontamination (mechanical, chemical, electrochemical, etc.)	as well as
decontamination of metal constructions, facilities, building surfaces, soils or persons are discussed in details. Attention is paid to the differences between decontamination details.	uring
operation and decontamination during decommissioning. Basic health and safety requirements and economic aspects of different processes of decontamination are also dis	cussed.
Emerging techniques and future trends are briefly mentioned.	
15KMD2 Contamination and Methods of Decontamination 2 ZK	3
The course is focused on the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the future trends in this fie	ld. Part of
the lectures is aimed at radioactive contamination with the emphasis corrosion products. Various methods of decontamination (mechanical, electrochemical, etc.)	as well as
decontamination of metal constructions, facilities, building surfaces, soils or persons are discussed in details. Attention is paid to the differences between decontamination di	uring
operation and decontamination during decommissioning. Basic health and safety requirements and economic aspects of different processes of decontamination are also dis	cussed.
Act ACA	4
IDLACT Laboratory Exercises I KZ	4 col (ion
chromatography roentgen diffraction XRE spectrophotometry) and radiochemical methods (gammaspectrometry liquid scintillation) Various methods of decontamination	
decontamination system mechanical chemical electrochemical decontamination) are tested. The inherent part is the evaluation of the results obtained and suggestion of the	
way of decontamination for different contaminated materials	; optimum
16MCRE Monte Carlo Method in Radiation Physics 77K	1
Basic principles of the MC method, probability theory and selected concepts in mathematical statistics. Jonising radiation transport simulation, photons, neutrons and charged	narticles
interactions and their simulation, modelling of the geometric conditions. Statistical tests of the model calculations, variance reduction techniques. Codes for simulation of rad	iation
transport, MCNP(X) code, properties and scope of usage, input file (description of the geometry, materials, sources, tallies), graphical tools, code user control. Tools for input	t fines
creation/editing a visualization (VISED, Sabrina, Body Builder). Examples of application (practical training) concentrated on radiation physics (shielding, radiation fields/beams	s/sources,
spectral/spatial distributions of the dosimetric quantities, responses of detection systems, radiation protection tasks. The basics of working with the program Fluka and Gean	t, SRIM
code for simulation of the transport of charged particles.	
15NRO1 Radioactive Waste and Spent Nuclear Fuel Management 1 ZK	3
The lessons offer the summary of the issue of radioactive waste from the beginning to the final disposal. Attention is paid to the both - wastes coming from nuclear fuel cycle	and
institutional wastes. Radioactive waste classification as well as their characterization and waste management and treatment are discussed in details. Issues of spent nuclear	e
	r fuel, its
transportation and storage, transmutation technologies and advanced fuel cycles are also discussed. Significant part of the lectures is also safety and legal requirements an	d public
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16RISK	Data Processing - Prognoses and Risk Assessment	Z,ZK	5
The aim of the course is	to acquaint students with the theoretical basis necessary for description and processing of experimental data. Theoretical know	vledge is then app	lied to illustrative
examples of practical da	ata processing, and students will learn how to use available software for experimental data processing. In addition, the aim of	the course is to a	cquaint students
with tools for risk analys	is and their qualitative and quantitative evaluation.		

Code of the group: NMSPVJZP2 Name of the group: NMS P_VJZPN 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:	
			3	

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
17BAL	Safety Analyses Jan Frýbort, Jan Rataj Jan Frýbort (Gar.)	ZK	2	2+0	Z	Р
15DPV1	Master Thesis 1 Mojmír N mec Mojmír N mec (Gar.)	Z	10	10ZP	Z	Ρ
15DPV2	Master Thesis 2 Mojmír N mec Mojmír N mec (Gar.)	Z	20	20ZP	L	Ρ
17EK	Economics of Nuclear Facilities Radovan Starý Radovan Starý Radovan Starý (Gar.)	ZK	2	2+0	Z	Р
16KVR	Communication with Public Ivana Fojtíková Ivana Fojtíková (Gar.)	Z	2	2S	L	Р
17LAC2	Laboratory Exercises 2 Jan Rataj, Milan Štefánik Milan Štefánik Jan Rataj (Gar.)	KZ	4	4L	Z	Р
16LEG	Legislation Ji í Martin ík Lenka Thinová Tomáš Trojek (Gar.)	ZK	2	2P+0C	Z	Р
16MEMO	Methods of Monitoring and Metrology Pavel Novotný Petr Pr ša Petr Pr ša (Gar.)	Z,ZK	3	2P+1C	Z	Ρ
15NRO2	Radioactive Waste and Spent Nuclear Fuel Management 2 Kate ina ubová, Evžen Losa Evžen Losa Kate ina ubová (Gar.)	ZK	3	3P	L	Ρ
15PAX	Internship Václav uba Václav uba (Gar.)	Z	2	1XT	Z	Р
16SEMO	Expert Seminar Kate ina Pila ová Kate ina Pila ová Kate ina Pila ová (Gar.)	KZ	3	3S	L	Р

Characteristics of the courses of this group of Study Plan: Code=NMSPVJZP2 Name=NMS P_VJZPN 2nd year

17BAL	Safety Analyses	ZK	2
Subject makes students f	amiliar with safety analyses carried out during radioactive wastes (RAW) handling and spent nuclear fuel (SNF) handling. N	lore specifically, s	safety analyses
aim at transport, storage	casks and disposal canisters for RAW and SNF and further at storages and deep geological repositories (DGR) of RAW an	d SNF. In the fran	ne of lectures,
students get overview ab	out analyses aimed at determination of radioactive inventory of RAW or SNF, assurance of subcriticality, shielding, retentior	n system, and hea	at transfer
(thermo-physical characte	eristics) from assembly packages, storages, and DGR of the RAW or the SNF, searching of transport paths and mechanism	is of radioactive is	otopes releases
into environment, release	is of radionuclides at normal or abnormal and accident conditions during handling with RAW and SNF.		
15DPV1	Master Thesis 1	Z	10
The diploma project is ba	sed 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 disc	cussions.		
15DPV2	Master Thesis 2	Z	20
The diploma project is ba	sed 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 disc	cussions.		
17EK	Economics of Nuclear Facilities	ZK	2
The course focuses on th	\dot{r} economic evaluation of nuclear power plants, including assessment of the impact of the lifetime of nuclear installations. \dot{r}	he first lectures a	re focused on
the introduction to econor	mics and further on the basic course of microeconomics. The lectures continue with an overview of the business economics	s, explanations of	the concepts of
revenues, costs etc. and t	their application in the evaluation of the sources of energy. The second half of the lectures are focused on the economic asp	ects of the fuel cy	cle, construction
and operation of power p	lants and also their decommissioning. In conclusion, the students will get acquainted with the basic methods of economic e	valuation of inves	tments.
16KVR	Communication with Public	Z	2
The aim of the course is to	o acquaint students with basic concepts in the field of social communication, to illustrate them various aspects of effective co	mmunication plan	ning on practical
demonstrations, and to pr	repare them for possible situations where they will be forced to communicate with the general public in their practice.		
17LAC2	Laboratory Exercises 2	KZ	4
The subject is composed	of practical experimental tasks (exercises) in the field of nuclear instrumentation apparatuses, sources of ionization radiation	n, study of ionizat	ion radiation and
its behaviour in the different	ent environments, nuclear fission, ionizing radiation detection and applications focused on handling with sources of ionizing	radiation and pro	tection against
ionizing radiation. The exe	ercises will be carried out at the VR-1 university reactor and in the specialized labs of the department of nuclear reactors and	department of th	e dosimetry and
ionizing radiation. Brief le	cture precedes the exercise and focuses on the given experimental task. These tasks will be theoretically introduced by lect	ture which familia	rizes students
with the studied issues ar	nd instructs how to do the exercise.		
16LEG	Legislation	ZK	2
The course works with th	e essential points of the laws and the implementing legislation concerning the preparation for decommissioning, decommis	sioning, including	legislative
requirements for the prote	ection of employees and the environment against radiation and waste management including transport and storage.		
16MEMO	Methods of Monitoring and Metrology	Z,ZK	3
The aim of the course is t	to acquaint students with legislative requirements for monitoring of radiation quantities and their practical implementation. In	addition, an intro	oduction to the
metrology of radiation gu	antities is part of the course.		

15NRO2	Radioactive Waste and Spent Nuclear Fuel Management 2	ZK	3	
The lessons offer the summary of the issue of radioactive waste from the beginning to the final disposal. Attention is paid to the both - wastes coming from nuclear fuel cycle and				
institutional wastes. Ra	institutional wastes. Radioactive waste classification as well as their characterization and waste management and treatment are discussed in details. Issues of spent nuclear fuel, its			
transportation and stora	transportation and storage, transmutation technologies and advanced fuel cycles are also discussed. Significant part of the lectures is also safety and legal requirements and public			
attitude towards radioactive waste treatment. At the end of the lectures current situation on Czech Republic and in the world is mentioned.				
15PAX	Internship	Z	2	
The internship aims at	providing the student with practical experience from the operation of nuclear facilities. Students work individually following the	instructions of sup	pervising person.	
The experience gained	during the practical training is assessed in final report.			
16SEMO	Expert Seminar	KZ	3	
This course consists of	This course consists of lectures held by specialists in the field (representatives of companies and research institutes).			

Name of the block: Elective courses

Minimal number of credits of the block: 0 The role of the block: V

Code of the group: NMSPVJZPV Name of the group: NMS P_VJZPN Optional courses Requirement credits in the group: Requirement courses in the group: Credits in the group: 0 Note on the group:

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	V
15APRM	Application of Radiation Methods Viliam Mú ka Viliam Mú ka Viliam Mú ka (Gar.)	ZK	2	2+0	L	V
15NUK1	Aplication of Radionuclides 1 Ji í Mizera Ji í Mizera Ji í Mizera (Gar.)	ZK	3	2+0	Z	V
15NUK2	Aplication of Radionuclides 2 Ji í Mizera Ji í Mizera Ji í Mizera (Gar.)	ZK	3	2+0	L	V
16DNEU	Neutron Dosimetry Michal Košál, Ond ej Ploc Ond ej Ploc (Gar.)	ZK	2	2+0	3	V
16DZAR	Dosimetry of Internal Radiation Sources Ladislav Musílek Ladislav Musílek (Gar.)	ZK	2	2+0	4	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
16MMM	Mathematical Methods and Modelling Tomáš Urban Jaroslav Kluso (Gar.)	Z	2	0+2	3	V
18MEMC	Monte Carlo Method Jaromír Kukal, Miroslav Virius Miroslav Virius (Gar.)	Z,ZK	4	2P+2C	Z	V
16MER	Instrumentation for Radiation Measurements Petr Pr ša Petr Pr ša Petr Pr ša (Gar.)	ZK	2	2+0	1	V
15MSZP	Modelling and Simulation of Radionuclide Migration in the Environment Aleš Vetešník, Dušan Vopálka Aleš Vetešník Dušan Vopálka (Gar.)	Z,ZK	3	2+1	Z	V
14NMR	Materials Science for Reactors Petr Haušild Petr Haušild (Gar.)	ZK	2	1P+1C	6	V
17NJZ	New Nuclear Sources Tomáš Bílý Tomáš Bílý Tomáš Bílý (Gar.)	ZK	3	3+0	Z	V
15RACHA	Radiation Chemistry Václav uba	ZK	2	26P+0C	Z	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
15SMJ1	Separation Methods in Nuclear Chemistry 1 Mojmír N mec Mojmír N mec Mojmír N mec (Gar.)	ZK	3	3+0	Z	V
15SMJ2	Separation Methods in Nuclear Chemistry 2 Mojmír N mec Mojmír N mec Mojmír N mec (Gar.)	ZK	2	2+0	L	V
16SPD	Spectrometry in Dosimetry Pavel Novotný Pavel Novotný Tomáš echák (Gar.)	ZK	2	2P+0C	Z	V
15SRZP	Determination of Radionuclides in Environment Mojmír N mec Mojmír N mec Mojmír N mec (Gar.)	ZK	2	2+0	L	V
01SUP	Start-up Project	KZ	2	2P+0C		V

17VYRE	Nuclear Research Installations ubomír Sklenka, Jana Matoušková ubomír Sklenka ubomír Sklenka (Gar)	ZK	4	2P+2C	Z	v
Characteristics of the	courses of this group of Study Plan: Code=NMSPVJZPV Nam	e=NMS P_VJ		tional co	urses	1
16AMMN Met	hods of Analytical Measurement				KZ	2
Principles, technical performa	ance and utilization of methods of chemical analysis. Methodology of analytical deterr	mination, gravime	try, titration	methods, po	tentiometry, p	olarography,
refractometry, polarimetry, U\	/-VIS spectroscopy, atomic emission and absorption spectroscopy, infrared and Rama	an spectroscopy,	X-ray struct	ural analysis	, nuclear mag	netic and
electron spin resonance, mas	s spectrometry, thermometric methods, gas and liquid chromatography.					
15APRM Apr	Dication of Radiation Methods				ZK	2
The beginning part is devoted	to the quantities and units of interaction of ionizing radiation with matter the description	tion of radiation s	ources and	facilities Ne	xt chapters ar	e devoted to
radiation technologies such as	s sterilization cross-linking and degradation of polymers polymerization grafting and c	uring radiation tre	atment of a	nicultural or	oducts radiati	on synthesis
Last but not least attention is	e devoted also to radiation processing in environment radiation in medical application	ns economic con	siderations	and dosime	try in context	of safety
	devoted also to radiation processing in environment, , radiation in medical applicatio		1310612110113			
15NUK1 API	cation of Radionuclides 1				ZK	3
In the introduction, nuclear m	ethods and their basic principles are generally classified. It is followed by explanation	of the specific fea	atures of wo	rking metho	ds in radioche	emistry. The
following lectures introduce se	parately physical principles and practical applications of radiochronometry, methods ba	ased on chemical,	biological a	nd physical	effects of ioniz	ing radiation,
indicator methods, isotope ex	change reactions and isotopic effects. The most important technical and industrial ap	plications of radio	onuclides ar	e presented		
15NUK2 Apl	ication of Radionuclides 2				ZK	3
The course is oriented to app	lications of nuclear methods and radionuclides, particularly in the field scientific resea	arch. The first part	of the cour	se presents	production an	d application
of artificial radionuclides. labe	eled organic compounds, and generators of short-lived radionuclides. Another part of	the course focuse	es on isotop	e exchange	reactions and	methods of
their investigation. It is followed	ad by explanation of thermodynamic and kinetic isotopic effects. The remaining lecture	es are devoted to	applications	of nuclear	methods in ae	eneral and
physical chemistry to study ki	netics and mechanism of chemical reactions, structure of chemical compounds, solid	I nhase surfaces	catalysis a	nd to determ	nine nhysico-c	hemical
parameters		i pridoc odridoco,	outury 515, u		ine physico c	nemioar
					71/	
16DNEU Neu	Jtron Dosimetry				ZK	2
Methods based on nuclear re	actions with neutrons, methods based on recoiled nuclei, the time-of-flight method, ne	eutron selectors a	nd monoch	romators, ad	tivation metho	ods, methods
of integrating neutron dosime	try, possibilities of use of various methods, calibration of neutron dosimeters and other	er dose and dose	rate measu	ring instrum	ents.	
16DZAR Dos	simetry of Internal Radiation Sources				ZK	2
Assessment of the radiation b	burden during internal contamination by radioactive materials, dosimetric quantities, c	compartment mod	els of the ki	netics of rad	lioactive mate	rials. wavs of
taking into account age deper	idence in dosimetric models, limitation of validity of used models and procedures, asse	essment of the rad	iation burde	n from radio	pharmaceutic	als in nuclear
medicine - basic concepts de	eneral procedure for calculating the absorbed dose from radionbarmaceuticals finding	data about the b	iological bet	aviour of ra	dionharmaceu	iticals tables
of absorbed doses and limitat	tion of their validity, radiation burden for children, burden from contaminants in radion	harmaceuticals d	lovelonment	of methods	for assessme	ant of the
radiation burden from interna	sources, methods of measurement of internal contamination, detection in vive, ever	na manitoring m	onitoring of	workplaces	101 2336331116	
		eta monitoring, m			-	
04MGA1 Eng	Jlish for Academic Purposes Speaking Practice - intermediate				Ζ	2
Optional course offers Master	's Degree students at intermediate level of English a chance to improve, develop, an	d strengthen their	vocabulary	and speaki	ng skills. Cour	se syllabus
will respond to specific profes	sional interests and situations of students and choice of topics will be agreed on with	tutor. Course is a	a non-grade	d assessme	nt course.	
04MGA2 Aca	ademic English Writing and Presentation Course - intermadiate				Z	2
Optional course, a possible fr	ee sequel to course 04MGA1, offers Master's degree students at intermediate level of	of English a chanc	e to develo	o, improve, a	and strengther	n their writing
and presentation skills. Syllab	ous will respond to specific professional needs of participants, but will include also wri	iting and preparin	g a presenta	ation on owr	research top	ic, a search,
instruction on writing Master	thesis in English and presenting chosen facts. Course will thus prepare students for p	presentations at co	onferences.	Course is a	non-graded a	ssessment
course.					0	
	thematical Methods and Modelling				7	2
	netheda, medelling and data processing in desimatry, radiological physical medicine -		nhusion Dr			Z aluation of
Application of mathematical	neurous, modeling and data processing in dosimenty, radiological physics, medicine a		physics. Fit	otion of high		alling (Monto
Spectra (peak search and nul	ig, deconvolution), data analysis, statistical processing and visualization (smoothing,	numerical differe	nuation, cre	ation of hist	ugrams), mou	
Carlo method) and examples	or applications (calculation of the response of detection systems, efficiency and reso	iution, calculation	s of the ang	ular energy	distributions of	of dosimetric
quantities in radiation fields/b	eams, measuring methods simulation/design). Demonstration/training of applications	of selected code:	s (Gnuplot,	ROOT, MCN	IP, Vised, Sab	rina, Body
Builder,SRIM/TRIM, Geant).						
18MEMC Moi	nte Carlo Method			Z	Z,ZK	4
This courseis devoted to the	numerical method Monte Carlo and to its selected applications.					
16MER Inst	rumentation for Radiation Measurements				7K	2
Methods of the processing of	signal from detectors of ionizating radiation spectroscopical systems data processi	ng and overview o	of the related	l electronics		-
15MS7D	dolling and Simulation of Padianualida Migratian in the Environment				771/	2
	defining and Simulation of Radionuclide ivingration in the Environmel	IIL	lool c	<u>4</u>	.,∠r\	J
Introduction in ecological mod	Jeiling focused on the problems of radionuclide migration in the environment. Formula	ation of mathemat	ical and con	iputer mode	is, characteriz	zation of their
qualities. Models of dissolved	contaminants interaction with the solids phase, including sophisticated multi-compor	nent models. Prac	tical modelli	ng in the PF	IREEQC envi	ronment.
Simulation exercises with tran	sport codes prepared in the GoldSim environment.					
14NMR Mat	erials Science for Reactors				ZK 🛛	2
Materials for classical and fus	sion reactors				·	
17NJZ Nev	v Nuclear Sources				ZK	3
Course is devoted to new nuc	lear power systems. Students get familiar with reactor designs for near term future as y	vell as with desigr	nes under co	nsideration	for mid-term a	nd long-term
outlook Course covers reactor	r systems of generation III+ gen IV accelerator driven systems fusion systems the	eir concent advar	ntanes disa	dvantages (evolution curr	ent status
outlook			nagee, alea	aranagee,		oni otatao,
	listis a Observistary				71/	
15RACHA Rad	Jiation Chemistry				ZK	2
16REL Rad	liation Effects in Matter				ZK 🛛	2
History of radiolysis, track, sta	ages of radiolysis, reaction kinetics, radiation chemical yield, experiments in radiolysis	s, classical metho	ds, pulse ra	diolysis, EP	R, primary pro	oducts of
radiolysis, excited states, solv	vated electrons, free radicals, radiolysis of gases, water, water solutions, organic liquiv	ds, radiolysis of s	olid materia	s, ionic crys	tals, polymers	s, glasses,
metals and alloys. radiation te	echnology, sterilisation, crosslinking and degradation of polymers. treatment of foods.					. .,
15SM 11 Sor	paration Methods in Nuclear Chemistry 1				7K	2
	al chapters, at the beginning the chamistry of complex constants its rest.	ط متماماته الحالية	and fall-	 		Jone Mart
chapter diversity of sever	ar chapters, at the beginning the chemistry of complex compounds, its generation and	u stadility is discu	SSECI TOILOWE	eu with spec	auuri calculat	IUIIS. INEXt
chapter gives a general overv	ew of the separation methods and their comparison. Further, the fundamentals of liqui	u-ilquid extraction	, extraction	or chelates,		malography,
aneory of ion exchange togeth	rer with ton-exchange chromatography, and other chromatographic methods are disci	usseu, all includin	ig theoretica	n aspects of	ule methods,	widely used
agents, and practical example	es. The whole lecture is oriented to utilization of these methods in nuclear and radioch	nemistry, their adv	antages an	a specific re	aurrements in	the field.

15SMJ2	Separation Methods in Nuclear Chemistry 2	ZK	2	
The lecture is based an	d envolves Separation Methods in Radiochemistry I. Additional aspects of extraction separation methods such as classificative	on and description	n of the ion-pair	
formation extraction sys	téme, extraction with mixtures of agents, and accesories and devices used in solvent extraction. Separations with ion-exchar	nge resins includir	ng accesories	
and high performance liquid chromatography are discussed in more details. Finally, the lecture includes membrane separation processes, thermochromatography, distillation and				
electrochemical method	ls.			
16SPD	Spectrometry in Dosimetry	ZK	2	
The course deals with r	nethods and applications of ionizing radiation (i.e. photons, charged particles and neutrons) spectrometry. The most importar	it types of detecto	rs, individual	
components of the elec	tronic system used in spectrometry as well as spectra analysis procedures are discussed in detail.			
15SRZP	Determination of Radionuclides in Environment	ZK	2	
The introduction of the	ecture consit of the list of the important and monitored radionuclides in the environment and their abundance. Sample types,	sampling and pre	-treatment of	
samples are discussed	followed with quality assurance of analysis and their relation. The attention is also paid to individual instrumental separation m	ethods for enviror	mental samples	
such as gamma-ray spe	ectrometry and gross alpha and beta activities measurement. Finally, the methods for determination of the selected radionucl	ides (isotopes of a	uranium and	
plutonium, 210Po, 210F	b, 226Ra, 222Rn, 3H, 14C, 85Kr, 131I, 137Cs, 90Sr) are discussed.			
01SUP	Start-up Project	KZ	2	
17VYRE	Nuclear Research Installations	ZK	4	
The course is focused of	n technology, operation and utilisation of nuclear research installations (research reactors) and its particular features compar	ing to nuclear pov	ver plants. At the	
beginning of the course	history and classification of re-search reactors are discussed. The second part is focused on research reactor operation, saf	ety, management	as well as to	
intention to build resear	ch reactor, construction and commissioning of research reactor. The third part of the course deal with research reactors utilis	ation such as neu	utron activation	
analysis, radioisotope p	roduction, neutron imaging, silicon doping etc. The last part of lectures is dedicated to research reactor technology and exampl	es of typical subc	ritical and critical	
assemblies; low, mediu	n and high power research reactors which are in operation worldwide. The course also consists of hands-on laboratories at t	he Training reacto	vr VR-1 which	
give students practical a	application of the theory presented during the lectures. Part of the laboratories is hands-on training of the VR-1 reactor opera	tion when student	s are learning	
how to operate the read	tor.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
01SUP	Start-up Project	KZ	2
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 cour	se.
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	e, 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 topic	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.		
14NMR	Materials Science for Reactors	ZK	2
	Materials for classical and fusion reactors		
14SAVM	Structures and Properties of Materials	ZK	3
The content of th	e course is fundamental information about structural materials with the main emphasis on metals. Structure of materials, mechanical	properties and the	eir testing,
	production and manufacturing technologies are explained in mutual relations, together with a brief list of the most important mai	erials.	
15APRM	Application of Radiation Methods	ZK	2
The beginning part	is devoted to the quantities and units of interaction of ionizing radiation with matter, the description of radiation sources and facilities	. Next chapters are	e devoted to
radiation technologi	es such as sterilization, cross-linking and degradation of polymers, polymerization, grafting and curing, radiation treatment of agricultura	al products, radiatio	n synthesis,
Last but not least	, attention is devoted also to radiation processing in environment, , radiation in medical applications, economic considerations and d	osimetry in context	of safety.
15CHPR	Chemistry of Problematic Radionuclides	ZK	2
The course focuse	es on properties, chemical behaviour, speciation, and origin of radionuclides, which are considered to be problematic for their behavio	our in radioactive w	aste or for
the determination o	f their activity. The radionuclides monitored in the radioactive waste repositories are of the main interest. For these radionuclides, various	s separation and m	easurement
methods needed fo	r their determination in common matrices will be discussed. Determination and use of correlation factors will be explained as well as t	ne reasons and cor	nsequences
	of the legal activity limits of the respective radionuclides.		
15DPV1	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.		
15DPV2	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	ect supervisor duri	ng common
	regular meetings and discussions.		
15KMD1	Contamination and Methods of Decontamination 1	ZK	2
The course is focus	ed on the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the fu	uture trends in this	field. Part of
the lectures is aime	d at radioactive contamination with the emphasis corrosion products. Various methods of decontamination (mechanical, chemical, el	ectrochemical, etc) as well as
decontamination	of metal constructions, facilities, building surfaces, soils or persons are discussed in details. Attention is paid to the differences betw	een decontaminati	on during
operation and dec	ontamination during decommissioning. Basic health and safety requirements and economic aspects of different processes of deconta	amination are also	discussed.
	Emerging techniques and future trends are briefly mentioned.		
15KMD2	Contamination and Methods of Decontamination 2	ZK	3
The course is focus	ed on the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the fundamental principles of contamination and decontamination from the preplanning and operational consideration till the fundamental principles of the preplanning and the prepla	uture trends in this	field. Part of
the lectures is aime	d at radioactive contamination with the emphasis corrosion products. Various methods of decontamination (mechanical, chemical, el	ectrochemical, etc) as well as
decontamination	of metal constructions, facilities, building surfaces, soils or persons are discussed in details. Attention is paid to the differences betw	een decontaminati	on during
operation and dec	ontamination during decommissioning. Basic health and safety requirements and economic aspects of different processes of decont	amination are also	discussed.
	Emerging techniques and future trends are briefly mentioned		

15LAC1	Laboratory Exercises 1	KZ	4
Laboratory exercises are focused on c	chemical (radiochemical) part of decommissioning. Students will be introduced to characterization of radioactive ma	aterials using che	mical (ion
chromatography, roentgen diffraction, X	RF, spectrophotometry) and radiochemical methods (gammaspectrometry, liquid scintillation). Various methods of	of decontaminatio	on (modular
decontaminating system mechanical, ch	hemical, electrochemical decontamination) are tested. The inherent part is the evaluation of the results obtained and	d suggestion of th	ne optimum
	way of decontamination for different contaminated materials.		
15MSZP	Modelling and Simulation of Radionuclide Migration in the Environment	Z,ZK	3
Introduction in ecological modelling focu	used on the problems of radionuclide migration in the environment. Formulation of mathematical and computer mod	lels, characteriza	tion of their
qualities. Models of dissolved contam	inants interaction with the solids phase, including sophisticated multi-component models. Practical modelling in the	PHREEQC envi	ronment.
	Simulation exercises with transport codes prepared in the GoldSim environment.	714	
15NRO1	Radioactive Waste and Spent Nuclear Fuel Management 1	ZK	3
I he lessons offer the summary of the	e issue of radioactive waste from the beginning to the final disposal. Attention is paid to the both - wastes coming fri	om nuclear fuel c	cycle and
Institutional wastes. Radioactive waste	classification as well as their characterization and waste management and treatment are discussed in details. Issu	les of spent nucle	ear fuel, its
attitude towards r	adioactive waste treatment. At the end of the lectures current situation on Czech Republic and in the world is ment	ioned	
	Rediaactive Waste near Shart Nuclear Fuel Management 2		2
The lessons offer the summary of the	Radioactive waste from the beginning to the final dispesse. Attention is paid to the both wastes coming fr		
institutional wastes Radioactive waste	classification as well as their characterization and waste management and treatment are discussed in details. Issue		or fuel its
transportation and storage transmutat	tion technologies and advanced fuel cycles are also discussed. Significant part of the lectures is also safety and lec	nal requirements :	and public
attitude towards r	adjoactive waste treatment. At the end of the lectures current situation on Czech Republic and in the world is menti	ioned.	
15NUK1	Anlication of Radionuclides 1	7K	3
In the introduction nuclear methods ar	Aprication of Nation defines in	∠ı hods in radiocher	mistry The
following lectures introduce separately p	hysical principles and practical applications of radiochronometry, methods based on chemical, biological and physical	effects of ionizin	g radiation
indicator methods. isotope	exchange reactions and isotopic effects. The most important technical and industrial applications of radionuclides	are presented.	J
15NUK2	Aplication of Radionuclides 2	ZK	3
The course is oriented to applications o	f nuclear methods and radionuclides, particularly in the field scientific research. The first part of the course presents	s production and	application
of artificial radionuclides, labeled organ	nic compounds, and generators of short-lived radionuclides. Another part of the course focuses on isotope exchang	e reactions and r	nethods of
their investigation. It is followed by exp	planation of thermodynamic and kinetic isotopic effects. The remaining lectures are devoted to applications of nucle	ar methods in ge	neral and
physical chemistry to study kinetics a	and mechanism of chemical reactions, structure of chemical compounds, solid phase surfaces, catalysis, and to de	termine physico-o	chemical
	parameters.		
15PAX	Internship	Z	2
The internship aims at providing the stu	dent with practical experience from the operation of nuclear facilities. Students work individually following the instruct	ctions of supervis	ing person.
	The experience gained during the practical training is assessed in final report.		
15PCJE	Chemistry Programme of Nuclear Power Plants	Z,ZK	3
The course deals with the principles of	water technology and chemistry of nuclear power plants (NPP). The main attention is paid to the individual technolo	ogical operations	used to the
purification of feeding waters and cooli	ing circuits waters and of all liquid and gaseous radioactive media encountered in NPP. The technological operation	ns used for the tre	eatment of
wastes and the corrosion problems of the	he construction materials are discussed in detail, too. Students will be able to evaluate and to assess the effect of t	echnological para	ameters on
	the processes of water treatment and decontamination.		
15RACHA	the processes of water treatment and decontamination. Radiation Chemistry	ZK	2
15RACHA 15SMJ1	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1	ZK	2 3
15RACHA 15SMJ1 This lecture consists of several chapte	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1 ers, at the beginning the chemistry of complex compounds, its generation and stability is discussed followed with sp	ZK ZK Deciation calculati	2 3 ions. Next
15RACHA 15SMJ1 This lecture consists of several chapter gives a general overview of the several overview overv	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1 ers, at the beginning the chemistry of complex compounds, its generation and stability is discussed followed with sp separation methods and their comparison. Further, the fundamentals of liquid-liquid extraction, extraction of chelates	ZK ZK peciation calculati	2 3 ions. Next natography,
15RACHA 15SMJ1 This lecture consists of several chapter chapter gives a general overview of the st theory of ion exchange together with ion	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1 ers, at the beginning the chemistry of complex compounds, its generation and stability is discussed followed with sp separation methods and their comparison. Further, the fundamentals of liquid-liquid extraction, extraction of chelates in-exchange chromatography, and other chromatographic methods are discussed, all including theoretical aspects of the specific extraction of	ZK ZK Deciation calculati , extraction chrom of the methods, w	2 3 ions. Next natography, videly used
15RACHA 15SMJ1 This lecture consists of several chapter chapter gives a general overview of the stheory of ion exchange together with ion agents, and practical examples. The vertex of the set of the	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1 ers, at the beginning the chemistry of complex compounds, its generation and stability is discussed followed with sp separation methods and their comparison. Further, the fundamentals of liquid-liquid extraction, extraction of chelates n-exchange chromatography, and other chromatographic methods are discussed, all including theoretical aspects of whole lecture is oriented to utilization of these methods in nuclear and radiochemistry, their advantages and specific	ZK ZK Deciation calculati , extraction chrom of the methods, w c requirements in	2 3 ions. Next natography, videly used the field.
15RACHA 15SMJ1 This lecture consists of several chapter chapter gives a general overview of the st theory of ion exchange together with io agents, and practical examples. The v 15SMJ2	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1 ers, at the beginning the chemistry of complex compounds, its generation and stability is discussed followed with sp separation methods and their comparison. Further, the fundamentals of liquid-liquid extraction, extraction of chelates n-exchange chromatography, and other chromatographic methods are discussed, all including theoretical aspects of whole lecture is oriented to utilization of these methods in nuclear and radiochemistry, their advantages and specific Separation Methods in Nuclear Chemistry 2	ZK ZK Deciation calculati , extraction chrom of the methods, w c requirements in ZK	2 3 ions. Next natography, videly used the field. 2
15RACHA 15SMJ1 This lecture consists of several chapter chapter gives a general overview of the stheory of ion exchange together with io agents, and practical examples. The v 15SMJ2 The lecture is based and envolves Sep	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1 ers, at the beginning the chemistry of complex compounds, its generation and stability is discussed followed with sp separation methods and their comparison. Further, the fundamentals of liquid-liquid extraction, extraction of chelates n-exchange chromatography, and other chromatographic methods are discussed, all including theoretical aspects of whole lecture is oriented to utilization of these methods in nuclear and radiochemistry, their advantages and specific Separation Methods in Nuclear Chemistry 2 waration Methods in Radiochemistry I. Additional aspects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction separation methods such as classification and spects of extraction se	ZK ZK Deciation calculati , extraction chrom of the methods, w c requirements in ZK d description of the	2 3 ions. Next natography, videly used the field. 2 he ion-pair
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15RACHA 15SMJ1 This lecture consists of several chapter chapter gives a general overview of the stheory of ion exchange together with io agents, and practical examples. The v 15SMJ2 The lecture is based and envolves Sep formation extraction système, extraction and high performance liquid chromation	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1 ers, at the beginning the chemistry of complex compounds, its generation and stability is discussed followed with sp separation methods and their comparison. Further, the fundamentals of liquid-liquid extraction, extraction of chelates n-exchange chromatography, and other chromatographic methods are discussed, all including theoretical aspects of whole lecture is oriented to utilization of these methods in nuclear and radiochemistry, their advantages and specific Separation Methods in Nuclear Chemistry 2 waration Methods in Radiochemistry I. Additional aspects of extraction separation methods such as classification an on with mixtures of agents, and accesories and devices used in solvent extraction. Separations with ion-exchange rography are discussed in more details. Finally, the lecture includes membrane separation processes, thermochrom	ZK ZK Deciation calculati , extraction chrom of the methods, w c requirements in ZK d description of the resins including a hatography, distilla	2 3 ions. Next natography, videly used the field. 2 he ion-pair ccesories ation and
15RACHA 15SMJ1 This lecture consists of several chapter chapter gives a general overview of the state theory of ion exchange together with io agents, and practical examples. The v 15SMJ2 The lecture is based and envolves Sep formation extraction système, extraction and high performance liquid chromation	the processes of water treatment and decontamination. Radiation Chemistry Separation Methods in Nuclear Chemistry 1 ers, at the beginning the chemistry of complex compounds, its generation and stability is discussed followed with sp separation methods and their comparison. Further, the fundamentals of liquid-liquid extraction, extraction of chelates n-exchange chromatography, and other chromatographic methods are discussed, all including theoretical aspects of whole lecture is oriented to utilization of these methods in nuclear and radiochemistry, their advantages and specific Separation Methods in Nuclear Chemistry 2 waration Methods in Radiochemistry I. Additional aspects of extraction separation methods such as classification an on with mixtures of agents, and accesories and devices used in solvent extraction. Separations with ion-exchange r ography are discussed in more details. Finally, the lecture includes membrane separation processes, thermochrom electrochemical methods.	ZK ZK Deciation calculati , extraction chrom of the methods, w c requirements in ZK d description of tr resins including a natography, distilla	2 3 ions. Next natography, videly used the field. 2 he ion-pair ccesories ation and
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16KVR	Communication with Public	Z	2
The aim of the cour	se is to acquaint students with basic concepts in the field of social communication, to illustrate them various aspects of effective comm	unication planning	on practical
	demonstrations, and to prepare them for possible situations where they will be forced to communicate with the general public in the	r practice.	
16LEG	Legislation	ZK	2 vaislativo
	requirements for the protection of employees and the environment against radiation and waste management including transport and	i storage.	gisialive
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	control. Tools for i	nput fines
creation/editing a v	isualization (VISED, Sabrina, Body Builder). Examples of application (practical training) concentrated on radiation physics (shielding, re-	adiation fields/bear	ns/sources,
spectral/spatial dis	stributions of the dosimetric quantities, responses of detection systems, radiation protection tasks. The basics of working with the pro-	gram Fluka and Ge	ant, Skiw
16MEMO	Methods of Monitoring and Metrology	7 7K	3
The aim of the co	urse is to acquaint students with legislative requirements for monitoring of radiation quantities and their practical implementation. In a	, ddition, an introduc	tion to the
	metrology of radiation quantities is part of the course.		
16MER	Instrumentation for Radiation Measurements	ZK	2
Metho	ds of the processing of signal from detectors of ionizating radiation, spectroscopical systems, data processing and overview of the re	lated electronics.	
16MMM	Mathematical Methods and Modelling	Z	2
Application of ma	thematical methods, modelling and data processing in dosimetry, radiological physics, medicine and experimental physics. Processin	g, analysis and eva	aluation of
spectra (peak sear	ch and fitting, deconvolution), data analysis, statistical processing and visualization (smoothing, numerical differentiation, creation of	nistograms), mode	lling (Monte
Carlo method) and	examples of applications (calculation of the response of detection systems, efficiency and resolution, calculations of the angular energy fields (cause a second state of the angular energy).	rgy distributions of	dosimetric
quantities in radia	tion neids/beams, measuring methods simulation/design). Demonstration/training or applications or selected codes (Gnupiot, ROOT, Builder SPIM/TRIM, Geapt)	WCNP, VISED, Sab	rina, Body
16REI	Padiation Effects in Matter	7K	2
History of radioly	sis, track, stages of radiolysis, reaction kinetics, radiation chemical yield, experiments in radiolysis, classical methods, pulse radiolysi	s. EPR. primary pr	∠ oducts of
radiolysis, excited	states, solvated electrons, free radicals, radiolysis of gases, water, water solutions, organic liquids, radiolysis of solid materials, ionic	crystals, polymers	s, glasses,
	metals and alloys, radiation technology, sterilisation, crosslinking and degradation of polymers, treatment of foods.		
16RISK	Data Processing - Prognoses and Risk Assessment	Z,ZK	5
The aim of the cour	se is to acquaint students with the theoretical basis necessary for description and processing of experimental data. Theoretical knowled	ge is then applied to	o illustrative
examples of practic	al data processing, and students will learn how to use available software for experimental data processing. In addition, the aim of the	course is to acqua	int students
	with tools for risk analysis and their qualitative and quantitative evaluation.		
16SEMO		KZ	3
40000	This course consists of lectures held by specialists in the field (representatives of companies and research institutes).	71/	0
The course deals	Spectrometry In Dosimetry subject on a spectrometry The most important with methods and applications of ionizing radiation (i.e. photons, charged particles and pautrons) spectrometry. The most important	∠ n Noes of detectors	Z individual
	components of the electronic system used in spectrometry as well as spectra analysis procedures are discussed in detail.	spes of detectors,	individual
16V.IZ	Nuclear Facilities Decommissioning	7 7K	4
The subject is the p	reparation of graduates to solve the legislative aspects of the decommissioning process. Familiates with valid legislation on radiation pr	otection, training re	quirements
and the professio	nal competence of workers in waste management and decommissioning of workplaces III. and IV. categories. It works with the essen	tial parts of the law	s and the
implementing legis	lation concerning the preparation, implementation of site decommissioning, including legislative requirements for the protection of en	ployees and the e	nvironment
	against radiation and waste management in their categorization, transport and storage.		
17BAL	Safety Analyses	ZK	2
Subject makes stu	dents familiar with safety analyses carried out during radioactive wastes (RAW) handling and spent nuclear fuel (SNF) handling. Mor	e specifically, safet	y analyses
students get ov	erview about analyses aimed at determination of radioactive inventory of RAW or SNF assurance of subcriticality shielding, retention	system and heat	transfer
(thermo-physical cl	naracteristics) from assembly packages, storages, and DGR of the RAW or the SNF, searching of transport paths and mechanisms of	radioactive isotop	es releases
	into environment, releases of radionuclides at normal or abnormal and accident conditions during handling with RAW and SI	NF.	
17EK	Economics of Nuclear Facilities	ZK	2
The course focus	es on the economic evaluation of nuclear power plants, including assessment of the impact of the lifetime of nuclear installations. The	first lectures are for	ocused on
the introduction to	economics and further on the basic course of microeconomics. The lectures continue with an overview of the business economics, et	cplanations of the c	concepts of
revenues, costs etc	and their application in the evaluation of the sources of energy. The second hair of the lectures are focused on the economic aspects of new relates and also their decommissioning. In conclusion, the students will get acquisited with the basic methods of economic	of the fuel cycle, o	monte
			11111115.
The subject is com	Laboratory Evaraiana 2	V 7	4
	Laboratory Exercises 2	KZ	diation and
its behaviour in the	Laboratory Exercises 2 posed of practical experimental tasks (exercises) in the field of nuclear instrumentation apparatuses, sources of ionization radiation, st a different environments, nuclear fission, ionizing radiation detection and applications focused on handling with sources of ionizing radi	KZ udy of ionization ra diation and protecti	diation and
its behaviour in the ionizing radiation. T	Laboratory Exercises 2 posed of practical experimental tasks (exercises) in the field of nuclear instrumentation apparatuses, sources of ionization radiation, si e different environments, nuclear fission, ionizing radiation detection and applications focused on handling with sources of ionizing radiation in exercises will be carried out at the VR-1 university reactor and in the specialized labs of the department of nuclear reactors and de	KZ udy of ionization ra diation and protection partment of the do	idiation and on against simetry and
its behaviour in the ionizing radiation. T ionizing radiation.	Laboratory Exercises 2 posed of practical experimental tasks (exercises) in the field of nuclear instrumentation apparatuses, sources of ionization radiation, so a different environments, nuclear fission, ionizing radiation detection and applications focused on handling with sources of ionizing rad- he exercises will be carried out at the VR-1 university reactor and in the specialized labs of the department of nuclear reactors and de Brief lecture precedes the exercise and focuses on the given experimental task. These tasks will be theoretically introduced by lecture	KZ udy of ionization ra diation and protecti partment of the do e which familiarize	idiation and on against simetry and s students
its behaviour in the ionizing radiation. T ionizing radiation.	Laboratory Exercises 2 posed of practical experimental tasks (exercises) in the field of nuclear instrumentation apparatuses, sources of ionization radiation, st e different environments, nuclear fission, ionizing radiation detection and applications focused on handling with sources of ionizing rad- he exercises will be carried out at the VR-1 university reactor and in the specialized labs of the department of nuclear reactors and de Brief lecture precedes the exercise and focuses on the given experimental task. These tasks will be theoretically introduced by lectur with the studied issues and instructs how to do the exercise.	KZ udy of ionization ra diation and protecti partment of the do e which familiarize	idiation and on against simetry and s students
its behaviour in the ionizing radiation. T ionizing radiation. 17NJZ	Laboratory Exercises 2 posed of practical experimental tasks (exercises) in the field of nuclear instrumentation apparatuses, sources of ionization radiation, si e different environments, nuclear fission, ionizing radiation detection and applications focused on handling with sources of ionizing rad- he exercises will be carried out at the VR-1 university reactor and in the specialized labs of the department of nuclear reactors and de Brief lecture precedes the exercise and focuses on the given experimental task. These tasks will be theoretically introduced by lectur with the studied issues and instructs how to do the exercise. New Nuclear Sources	KZ udy of ionization ra diation and protecti partment of the do e which familiarize ZK	idiation and ion against simetry and s students
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17VUV1	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.			
17VUV2	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.			
17VYRE	Nuclear Research Installations	ZK	4
The course is focused on technology, operation and utilisation of nuclear research installations (research reactors) and its particular features comparing to nuclear power plants. At the			
beginning of the course history and classification of re-search reactors are discussed. The second part is focused on research reactor operation, safety, management as well as to			
intention to build research reactor, construction and commissioning of research reactor. The third part of the course deal with research reactors utilisation such as neutron activation			
analysis, radioisotope production, neutron imaging, silicon doping etc. The last part of lectures is dedicated to research reactor technology and examples of typical subcritical and critical			
assemblies; low, medium and high power research reactors which are in operation worldwide. The course also consists of hands-on laboratories at the Training reactor VR-1 which			
give students practical application of the theory presented during the lectures. Part of the laboratories is hands-on training of the VR-1 reactor operation when students are learning			
how to operate the reactor.			
17ZAJE	Equipment of Nuclear Power Plants	ZK	3
The aim of the subject is to familiarize students with essential machine equipment on different types of nuclear power plants, which are in contact with radioactive isotopes and which			
can be contaminated during operation and accidents. For example: pipes, valves and fittings, pumps, steam turbines, pressurizer systems, heat exchangers and above all steam			
generators. Part of the subject is also the description of safety and emergency systems (hydroaccumulators, systems for containment pressure reduction, etc.). Lectures are focused			
on descriptions of parameters, designs and materials of real devices which are in operation on different nuclear power plants. Students receive knowledge what is important for			
decommissioning, for communication with colleagues on nuclear power plants and also for practical life.			
18MEMC	Monte Carlo Method	Z,ZK	4
This course devoted to the numerical method Monte Carlo and to its selected applications.			

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2025-08-25, time 10:17.