Study plan

Name of study plan: Doctoral studies, daily studies

Faculty/Institute/Others: Faculty of Electrical Engineering

Department:

Branch of study guaranteed by the department: Welcome page

Garantor of the study branch:

Program of study: Electrical Engineering and Information Technology

Type of study: Doctoral full-time

Required credits: 20

Elective courses credits: 10 Sum of credits in the plan: 30

Note on the plan: ~Studijní plán je ur en školitelem pro každého doktoranda individuáln .\\

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 20

The role of the block: S

Code of the group: PKKPPP

Name of the group: Compulsory facultativetudy

Requirement credits in the group: In this group you have to gain at least 20 credits (at most 30)

Requirement courses in the group:

Credits in the group: 20

Note on the group: Aktuální předměty doktorského studia

Note on the group): Aktualni predmety dol	Klorskeno st	uuia			
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
XP02AME	Active Methods in Acoustics Ond ej Ji í ek	ZK		2P	L	S
XP02AMA	Active Methods in Acoustics Ond ej Ji í ek Ond ej Ji í ek (Gar.)	ZK	4	2P	L	S
XP37AEM	Acoustic and Electroacoustic Measurements Libor Husník Libor Husník Libor Husník (Gar.)	Z,ZK	4	2P+1S	L	S
XP37APF	Acoustics and Electroacoustics of Solid State Libor Husník	Z,ZK	4	3P+1L	Z	S
XP37AR	Speech Acoustics	ZK	4	2+0s	L	S
XP31ASN	Algorithms and Structures of Neurocomputers	ZK	4	2P+2S	L	S
XP34AIC	Ji í Jakovenko	ZK	3	1P+2C		S
XP31AEO	Electric Circuit Analysis	ZK	4	2P+2S	Z	S
XP04A2SZK	English Language	ZK	0		Z,L	S
XP04AZK	English Language Petra Juna Jennings, Markéta Havlí ková Petra Juna Jennings Petra Juna Jennings (Gar.)	ZK	0	0C	Z,L	S
XP04MIN	English Language 2 Petra Juna Jennings, Markéta Havlí ková, Pavla Péterová, Michael Ynsua, Erik Peter Stadnik Petra Juna Jennings Petra Juna Jennings (Gar.)	ZK	0	0C	Z,L	S
XP04A1ZK	English language 1	ZK	0		Z,L	S
XP04A1	English language 1 Petra Juna Jennings (Gar.)	NIC		4C	Z,L	S
XP04A2	English language 2 Petra Juna Jennings	NIC		4C	Z,L	S
XP04A2ZK	English language 2	ZK	0		Z,L	S
XP34AT	TCAD Tools Applications Jan Voves Jan Voves Jan Voves (Gar.)	ZK	4	2P+2C	L	S
XP37AEA	Applied Electroacoustics Petr Honzík Petr Honzík Petr Honzík (Gar.)	ZK	4	2P+2L	Z	S
XP32AKR	Applied Cryptography Tomáš Van k Tomáš Van k (Gar.)	ZK	4	4P + 0S	L	S
XP17APL	Applied Optoelectronics in Medicine Jan Vrba	ZK	4	2P+2C	Z	S

XP36ASP	Architecture of Symbolic Computers	ZK	4	2P+2S	L	S
XP37ARA	Josef Kolá Josef Kolá Neur en (Gar.) Architectural Acoustics	ZK	4	2P+2S	 L	S
	Libor Husník Libor Husník Libor Husník (Gar.)		-			_
XP31ART XP38ATM	Architectures for Real Time Implementation	ZK ZK	3	2P+2S 2P+2D	L	S
XP02BFY	Piantonia	Z,ZK	4	2P+2D 2P+2C	Z	S
XP33BID	Biophysics	Z,ZK ZK	4	2P+2S	Z	S
XEP33CML	Bionics Computational Intelligence Techniques for Machine Learning	Z,ZK	4	1P+1S	L	S
	Computational Intelligence Techniques for Machine Learning Computational Methods for Materials Science			1		_
XEP35CMS	Antonio Cammarata Antonio Cammarata Antonio Cammarata (Gar.)	Z,ZK	4	2P+2C	Z,L	S
XP04 1	Czech language 1 Czech language 1	NIC	0	4C	Z,L	S
XP04C1ZK	Markéta Havlí ková	ZK	0		Z,L	S
XP04C2ZK	Czech language 2 Markéta Havlí ková	ZK	0		L,Z	S
XP04 2	Czech language 2	NIC	0	4C	Z,L	S
XP31DSP	Digital signal processing Pavel Sovka	ZK	4	2P+2S	Z	S
XP31CZS	Digital signal processing Radoslav Bortel, Pavel Sovka, Petr Pollák Radoslav Bortel Radoslav Bortel (Gar.)	ZK	4	2P+2C	Z	S
XP33RG2	Reading Group Michaela Valentová, Miroslav Kulich, Giulia D'Angelo, Karel Zimmermann, Jan Kybic Karel Zimmermann Karel Zimmermann (Gar.)	ZK	4	2P+2S	Z,L	S
XP33RCV	Reading group in Pattern Recognition and Computer Vision Georgios Tolias, Torsten Sattler Georgios Tolias Georgios Tolias (Gar.)	ZK	4	2P+2S	Z,L	S
XP13DFD	Data and Functional Analysis of Production Systems Martin Molhanec Martin Molhanec (Gar.)	Z,ZK	4	2P+2S	L	S
XP13DEZ	Degradation processes of electridal equipment Karel Dušek, Ivan Kudlá ek, David Bušek Karel Dušek Karel Dušek (Gar.)	Z,ZK	4	2P+2L	Z	S
XP16HPH	History of Physic	ZK	4	2P+2S	Z,L	S
XP34ORD	Optical Radiation Detection and Detectors Václav Prajzler, Vít zslav Je ábek Václav Prajzler Václav Prajzler (Gar.)	ZK	4	2P+2C	L	S
XP36DRO	Diagnostics and Reconfiguration of Programmable Circuits	ZK	4	2P+2S	Z	S
XP34DTM	DIAGNOSTICS AND TESTING IN MICROELECTRONICS	ZK	3	2P+2C	L	S
XP15DVN	Diagnostics of HV and EHV Insulating Systems	Z,ZK	4	2P+2S	L	S
XP02DP	Electric Discharges and their Applications Pavel Kubeš, Karel ezá Karel ezá Pavel Kubeš (Gar.)	ZK	4	2P+2C	L	S
XP13DTF	Thin film diagnostics	Z,ZK	4	2P+2L	L	S
XP32DZS	Digital Signal Procesing in Telecommunications	ZK	4	4P + 0S	L	S
XP32DKS	Sizing of communications networks Petr Hampl Petr Hampl (Gar.)	ZK	4	2P + 2C+ 2D	L	S
XP33DID	Distributed Artificial Intelligence	ZK	4	2P+1S	Z	S
XP36DSV	Distributed Systems Jan Jane ek Jan Jane ek (Gar.)	ZK	4	2P	Z	S
XP36DSY	Distributed Systems Jan Jane ek Jan Jane ek	ZK	4	2P	Z	S
XP37DRS	Satellite communication and navigation systems František Vejražka	Z,ZK	4	2+2s	Z	S
XP14DSD	Dynamics of Electric Machines	ZK	4	4+0s	L	S
XP14DES	Dynamics of Electric Machines Miroslav Chomát Miroslav Chomát (Gar.)	ZK	4	2P+2C	Z	S
XP16EES	Economics of energy systems Old ich Starý, Tomáš Králík Old ich Starý Old ich Starý (Gar.)	ZK	4	2P+4D	Z,L	S
XP01EAL	Effect algebras	ZK	4	2+1	L	S
XP01EKM	Mathematics Models for Economics Kate ina Helisová	ZK	4	2P+1S	L	S
XP16ERU	Accounting	ZK	4	2P+2S	L	S
XP16EKO	Economics	ZK	4	2P+2S	Z	S
XP16MES	Economics and Management of Energy Systems	ZK	4	2P+2S	L	S
XP16EME	Economics and Management of Energetics	ZK	4	2P+2S	Z	S
XP16MEU	Economics and Management of Energetics	ZK	4	2P+2S	Z	S
	Economics of power markets					

XP16ERE	Economics of power generation from RES Jaroslav Knápek Jaroslav Knápek Jaroslav Knápek (Gar.)	ZK	4	2P+4D		S
XP37ELA	Elastoacoustics	ZK	4	2+0s	L	S
XP15ES	Electrical Lighting	Z,ZK	4	2P+2S	L	S
XP15ET	Electroheat	Z,ZK	4	2P+2S	L	S
XP02EVA	Jan Kyncl Jan Kyncl Jan Kyncl (Gar.) Physics for Electroenergetics	ZK	4	3P	Z	S
XP34ETS	Pavel Kubeš Pavel Kubeš Pavel Kubeš (Gar.) Electrical Transport in Semiconductors	ZK	4	2P+2C	Z	S
XP17ELD	Jan Voves Jan Voves (Gar.) Electrodynamics	ZK	4	2P+2C	Z	S
XP14EMC	Lukáš Jelínek Electromagnetic Compatibility	ZK	4	2P+2C		S
XP14ECD	Zden k e ovský Zden k e ovský Zden k e ovský (Gar.) Electromagnetic Compatibility	ZK	4	4+0s	 	s
XP38EMC	Zden k e ovský Electromagnetic Compatibility of Data Acquisition Systems	ZK	4	2P+2C		
	Jan Holub Jan Holub Jan Holub (Gar.) Energy Economy					S
XP15EH	Zden k Müller	Z,ZK	4	2P+2S	L	S
XP15EZP	Control in Power Engineering Ivo Doležel	Z,ZK	4	2P+2S	L	S
XP33ECD	Evolutionary Computing	ZK	4	2P+1S	Z	S
XP15EXE	Expert Systems in Electrical Power Engineering	Z,ZK	4	2P+2S	Z,L	S
XP16FVT	Philosophical Problems of Science and Technology	ZK	2	0P+4S	L,Z	S
XP16FIM	Financial Management Old ich Starý	ZK	4	2P+2S	Z	S
XP31FSK	Phonetic signals and their coding	ZK	4	2P+2S	L	S
XP31FON	Speech Phonetics and Advanced Voice Technologies Petr Pollák Petr Pollák Petr Pollák (Gar.)	ZK	4	2P+4D		S
XP15FAK	Photometry and Colorimetry	Z,ZK	4	2P+2S	L	S
XP37FOS	Photonic Imaging Systems Petr Páta Petr Páta Petr Páta (Gar.)	ZK	4	2P+2L+4D	Z	S
XP13FCD	Photovoltaics systems Jakub Holovský, Vít zslav Benda Vít zslav Benda (Gar.)	Z,ZK	4	2P+2L	L	S
XP04F1ZK	French language 1	ZK	0		Z,L	S
XP04F1	French language 1	NIC		4C	Z,L	S
XP04F2ZK	French language 2	ZK	0		Z,L	S
XP04F2	French language 2	NIC		4C	L,Z	S
XP01FA1	Functional Analysis 1	ZK	4	2P+2S	L	S
XEP33FLO	Fuzzy Logic Mirko Navara Mirko Navara (Gar.)	ZK	4	2P+0S	L	S
XP33FLO	Fuzzy Logic Mirko Navara	ZK	4	2P+0S	L	S
XP35FMD	Fuzzy Modelling and Control Petr Hušek	ZK	4	2P+2C	L	S
XP35FMC1	Fuzzy modeling and control Petr Hušek Petr Hušek Petr Hušek (Gar.)	ZK	4	2P+2C		S
XP37FZS	Fuzzy Signal Processing	Z,ZK	4	2+2s	L	s
XP37PAC	Physiological Acoustics Petr Maršálek, Václav Vencovský Václav Vencovský Petr Maršálek (Gar.)	ZK	4	2P+4D	Z	S
XP13FDD	Physic of Dielectrics Pavel Mach Pavel Mach Pavel Mach (Gar.)	Z,ZK	4	2P+2S	Z	S
XP02FPL	Solid State Physics	ZK	4	2P+2C	L	S
XP34ASD	Antonio Cammarata Antonio Cammarata Antonio Cammarata (Gar.) Physics of Advanced Semiconductor Devices and Materials	ZK	4	1P+3C+3D	Z,L	S
XP13FPD	Jan Voves Jan Voves Jan Voves (Gar.) Semiconductor Physics	Z,ZK	4	2P+2S	Z	S
XP02FPT	Vít zslav Benda Vít zslav Benda (Gar.) Physics for Therapy	Z,ZK	3	2P+1C	L	S
XP37FHA	Physiological, Psychological and Musical Acoustics	ZK	4	2+2s	L	S
XP37FHA1	Physiological, Pychologycal and Musical Acoustics 1	ZK	4	2P+0S	Z	s
XP37FHA2	Physiological, Psychological and Musical Acoustics 1 Physiological, Psychological and Musical Acoustics 2	ZK	4	2P+2S	 L	S
XP37GAB	Genesis and Analysis of Biosignals	ZK	4	3P+1S	 L	s
XP33GAD	Geometrical Algebras	ZK	4	2+0s	L	s
555/15	Pavel Pták	- 1 \	1 "	55	_	١ ٠

XP16HKA	Historical structures and technologies in architecture	NIC	2	0P+4S	Z,L	s
XP16HDS	History of Transport Systems and Communications	ZK	2	0P+4S	Z,L	s
XP16HEL	Marcela Efmertová History of Electrical Engineering	NIC	2	0P+4S	Z,L	S
XP16HIS	Marcela Efmertová Historiography of the Development of Science, Technology and the Methodology Zden k Beneš, Zden k Beneš Marcela Efmertová Zden k Beneš (Gar.)	ZK	4	2P+2S	Z,L	S
XP02HS	Noise Surveys	ZK	4	1P	L	S
XP36HS	Ond ej Ji í ek Hypermedia Systems and Internet Computing	ZK	4	2P+2S	L	S
XP37IAR	Ivan Jelínek Ivan Jelínek Ivan Jelínek (Gar.)	Z,ZK	4	2P+2S	Z	S
XP33IMD	Implementation algoritms in radioelecronics	ZK	4	2P+0S	L	S
	Informatics in Clinical Medicine	ZK	4		Z	
XP01ITZ	Integral Transforms and Z Transform Integrated Optics	ZK	4	2+1		S
XP34IO	Václav Prajzler, Vít zslav Je ábek Vít zslav Je ábek Vít zslav Je ábek (Gar.)	ZK	4	2P+2C	Z	S
XP12IMM	Engineering Methods in Mechanics	Z,ZK	4	2+2s	L	S
XP36JAI	Languages for Artificial Intelligence	ZK	4	2P+2S	Z	S
XP33CHM	Chapters in higher mathematics Mirko Navara, Pavel Pták, Dominika Burešová Pavel Pták Pavel Pták (Gar.)	ZK	4	2P		S
XP01KAS	Complexity and Combinatorical Algorithms	ZK	4	2+1	L	S
XP36KP	Marie Demlová Communication Protocols	ZK	4	2P	L	S
XP35CCM1	Jan Jane ek Cooperative control of multi-agent systems Kristian Hengster-Movric Kristian Hengster-Movric	ZK	4	2P+2C		S
XP34CNO	(Gar.) Integrated Optics	ZK	4	2P+2C	Z,L	S
XP16ECM1	Vít zslav Je ábek, Ji í tyroký Ji í tyroký Ji í tyroký (Gar.) Quantitative research methods in economy 1	ZK	4	2P+4D	Z	S
XP16ECM2	Lubomír Lízal Lubomír Lízal Lubomír Lízal (Gar.) Quantitative research methods in economy 2	ZK	4	2P+4D	L	s
	Lubomír Lízal			2P+2S		
XP16KVM	Quantitative Research Methods in Management	ZK	4		L Z	S
XP01KVP	Quantum Computing Medical Applications of Electromagnetic Field	ZK	4	2+2		S
XP17LAE	Jan Vrba Jan Vrba (Gar.) Aircraft Navigation	ZK	4	2P+2C	L	S
XP37LN	František Vejražka František Vejražka František Vejražka (Gar.)	ZK	4	2P+2S	L	S
XP35LMI	Linear Matrix Inequalities Didier Henrion	ZK	4	2P+2C	L	S
XP35LMI1	Linear matrix inequalities Didier Henrion Didier Henrion (Gar.)	ZK	4	2P+2C		S
XP35LSD	Linear Systems	ZK	4	2P+2C	L	S
XP36LSM	Logical Simulation	ZK	4	2P+2S	Z	S
XP33LPD	Logic and Logic Programming	ZK	4	2P+2S	L	S
XP38MPX	Magnetism in Engineering Practice Pavel Ripka Pavel Ripka Pavel Ripka (Gar.)	ZK	4	2P+2C	Z	S
XP02MHD	Magnetohydrodynamics Pavel Kubeš Pavel Kubeš Pavel Kubeš (Gar.)	ZK	4	2P	Z	S
XP16MAN	Management	ZK	4	2P+2S	L	S
XP16MAV	Production Management	ZK	4	2P+2S	L	S
XP33MZT	Management of Knowledge and Information Technologies	ZK	4	2P+1S	L	S
XP16MAU	Accounting for management	ZK	4	2P+2S	L	S
XP16MAR	Marketing	ZK	4	2P+2S	Z	S
XP16MAS	Marketing Strategies	ZK	4	0P+4S	Z	S
XP33MAD	Mathematical Analysis of Dempster-Shafer Theory	ZK	2	2P+0S	Z	S
XP01MST	Mathematical Statistics	ZK	4	2+1	L	S
XP01MTS	Mathematical Methods in Signal Theory	ZK	4	2+1	Z	s
XP01MKR	Mathematics for cryptography	ZK	4	2+1	Z	s
XP33MKD	Mathematics for Cybernetics - Selected Topics	ZK	4	2P+2S	L	S
	Pavel Pták Materials and Technologies for Photonic Devices and					
XP34MTP	Structures	ZK	3	2P	Z	S

	Václav Prajzler Václav Prajzler Václav Prajzler (Gar.)					
XP01MTP	Matrix Calculus Martin K epela Pavel Pták Martin K epela (Gar.)	ZK	4	2P+1S	L	S
XP15MPE	Mechatronics in Electrical Power Engineering	Z,ZK	4	2P+2S	L	S
XP38MMN	Measurement of Nonelectric Quantities Pavel Ripka Pavel Ripka Pavel Ripka (Gar.)	ZK	4	2P+2L	L	S
XP15MVN	High Voltage Measurement	Z,ZK	4	2P+2S	L	S
XP37MVP	Scientific Work Methodology	ZK	4	4P+0S	Z	s
XP17MVP	Stanislav Vítek Miloš Klíma Methodology of Science	ZK		2P+2C		s
	Milan Polívka Milan Polívka Milan Polívka (Gar.) Analysis and visualization methods for medical data					
XP33MMD	Jan Kybic	Z,ZK	4	2P+2C	L	S
XP17MAPP	Analysis Methods for Passive Elements of Microwave and Millimeter-wave Technique Jan Machá, Vít zslav Pankrác Jan Machá (Gar.)	ZK	4	2P+2C	Z	S
XP38MDR	Methods of Signals Digitalization and Reconstruction Josef Vedral Josef Vedral (Gar.)	ZK	4	2P+2C	L	S
XP38MPM	Methods for Precision Measurement of Electrical Quantities and Measurement Data Processing	ZK	4	2P+2C	Z	S
XP38MET	Metrology	ZK	3	2P+2L		S
XP14MID	Microprocessor Control of Electric Drives	ZK	4	4+0s	Z,L	S
XP14MIP	Microprocessor Control of Electric Drives	ZK	4	4+0s	Z,L	S
XP14MIR	Microprocessor Control of Electric Drives	ZK	3	4+0s	Z,L	S
XP34MSY	Microsystems	ZK	4	2P+2C	Z,L	S
XP34MSA	Miroslav Husák Miroslav Husák Miroslav Husák (Gar.) Microsystems and Microactuators Miroslav Husák	ZK	3	2P		S
XP17MT	Microwave Technique Jan Vrba, Karel Hoffmann Jan Vrba Karel Hoffmann (Gar.)	ZK	4	2P+2C	Z	s
XP32MOS	Mobile Networks Pavel Mach, Zden k Be vá, Robert Bešák Zden k Be vá Zden k Be vá	ZK	4	2P + 2C	Z	S
XP33MOL	(Gar.) Modal Logics for Distributed Systems	ZK	4	2P+0S	Z	s
XP13MSD	Modelling and Simulation of Technological Systems	Z,ZK	4	2P+2C	Z	S
XP33ICT	Pavel Mach Pavel Mach Pavel Mach (Gar.) Modern ICT for Industry and Smart Grids	ZK	4	2P+0S	L	S
XP02MPF	modern for for industry and officer office	Z,ZK	2		Z	S
XP14RPD	Advanced Controlled Drives	ZK	3	4+0s	Z	S
XP14MPO	Advanced Controlled Drives	ZK	4	4+0s	Z	S
XP14MRP	Advanced Controlled Drives	ZK	3	4+0s	Z	S
XP37MSC	CNS Modern Systems	ZK	4	2+2s	Z,L	S
XP34APD	Advanced Power Semiconductor Devices and ICs Jan Vobecký Jan Vobecký (Gar.)	ZK	4	2P+2C	Z,L	S
XP14MZR	New Control Methods for Electric Drives	ZK	4	2P+2C	Z	S
XP14MPD	Jií Lettl Jií Lettl (Gar.) Advanced Control Methods of Electric Drives	ZK	4	4+0s	Z	S
XP37MPS	Multimedia Signals Transmission	ZK	4	2P+2S	Z	S
XP37NAV	Václav Žalud Vácľav Žalud Navigation systems	ZK	4	2P+2L		s
	Pavel Ková Design and circuit structures of electronic systems					
XP31NOS	Ji í Hospodka Ji í Hospodka Ji í Hospodka (Gar.) Digital filter synthesis	ZK	4	2P+2S	L	S
XP31DIF	Pavel Sovka	ZK	4	2P+2S	Z	S
XP34PIC	Programmable IC Design Pavel Hazdra Pavel Hazdra (Gar.)	ZK	4	2P+2C	Z	S
XP37NRO	CAD for RF and Microwave Circuits Josef Dobeš Josef Dobeš Josef Dobeš (Gar.)	Z,ZK	4	3P+1S	Z	s
XP35NES1	Nonlinear systems Sergej elikovský Sergej elikovský (Gar.)	ZK	4	2P+2C		s
XP35NES	Nonlinear Systems Sergej elikovský	ZK	4	2P+2C	L	S
XP04N1	German language 1	NIC		4C	Z,L	S
XP04N1ZK	German language 1	ZK	0		Z,L	S
XP04N2ZK	German language 2	ZK	0		Z,L	S
XP04N2	German language 2	NIC		4C	Z,L	S
XP36NSN	Neural Networks and Neurocomputers	ZK	4	2P+2S	Z	S

XEP33NEP	Neuroprosthetics	Z,ZK	4	2P+0S	Z	S
XP13NM	New Matherials and their Application	Z,ZK	4	2P+2S	L,Z	S
XP14MEN	New Trends in Converter Technology Zden k e ovský, Ji í Lettl Ji í Lettl Ji í Lettl (Gar.)	ZK	4	2P+2C	L,Z	S
XP14MTD	New Trends in Converter Technology Zden k e ovský	ZK	4	4+0s	L	S
XP14APR	New Trends in Electric Device Apply	ZK	3	4+0s	L	S
XP14NAP	New Trends in Electric Device Apply	ZK	4	4+0s	L	s
XP14APD	New Trends in Electric Device Applications	ZK	4	4+0s	L	S
XP14NTP	New Trends in Electric Device Theory	ZK	4	4+0s	Z	S
XP14TPR	New Trends in Electric Device Theory	ZK	3	4+0s	Z	S
XP14TPD	New Trends in Electric Device Theory	ZK	4	4+0s	Z	S
XEP33NUM	Numerical Analysis Mirko Navara	Z,ZK	4	2P+2S	L	s
XP33NUM	Numerical Analysis Mirko Navara	Z,ZK	4	2P+2S	L	S
XP01NLA	Numerical Linear Algebra	ZK	4	2P+1S	L	S
XP32NMR	Numerical Methodes of Electromagnetic Tasks Solution	ZK	4	4P + 0S	L	S
XP17NME	Numerical Methods in Electromagnetic Field Jan Machá	ZK	4	2P+2C	L	S
XP34EHA	Renewable Energy Microsources for Electronics - Energy Harvesting Miroslav Husák	ZK	4	2P		S
XP37IPP	Image Processing and Photonics Petr Páta Petr Páta (Gar.)	ZK	4	2P+2L	Z	s
XP32ODV	Intellectual property protection Ji í Hájek Ji í Hájek Ji í Hájek (Gar.)	ZK	4	2P + 0S	L	s
XP35OFD	Estimation and Filtering Vladimír Havlena	ZK	4	2P+2C	Z	s
XP35ESF1	Estimation and filtering Vladimír Havlena Vladimír Havlena (Gar.)	ZK	4	2P+2C		S
XP33OSD	Real Time Operating Systems	ZK	4	2P+1S	L	S
XP37ODS	Optical Design and Simulation	ZK	4	2P+2C		S
XP17OV	Optical Fibers Stanislav Zvánovec Stanislav Zvánovec (Gar.)	ZK	4	2P+2C	L	s
XP32OSY	Optical Systems	ZK	4	4P + 0S	L	S
XP35ORC1	Optimal and robust control Zden k Hurák Zden k Hurák Zden k Hurák (Gar.)	ZK	4	2P+2C		S
XP36PSV	Parallel Systems and Algorithms	ZK	4	3P+2S	L	S
XP01PDR	Partial Differential Equations	ZK	4	3P+0S	L	S
XP34PED	Advanced Electronic Devices	ZK	4	2P+2C	Z	S
XP13PED	Plastics in Electrical Engineering Ivan Kudlá ek Ivan Kudlá ek Ivan Kudlá ek (Gar.)	Z,ZK	4	2P+2S	Z	S
XP02PT	Plasma Technologies	ZK	4	2P	L	S
XP33VTP	Computer Vision Theory and Practice Ond ej Chum Ond ej Chum Ond ej Chum (Gar.)	ZK	4	2S	L	S
XP01POA	Advanced theory of operator algebras	ZK	4	2+1	L	S
XP39CG	Advanced Computational Geometry Petr Felkel Petr Felkel (Gar.)	ZK	4	2P+1C+4D	Z	S
XEP36AGT	Advanced Computational Game Theory Branislav Bošanský, Viliam Lisý Branislav Bošanský (Gar.)	ZK	4	2P+0C+4D		S
XP37CAD	Advanced methods for circuit analysis and optimization using computer-aided design Josef Dobeš Josef Dobeš Josef Dobeš (Gar.)	Z,ZK	3	2P+3D	Z	S
XP16AFM	Advanced Financial Management Methods Old ich Starý	ZK	4	2P+4D	Z,L	S
XP39UID	Advanced methods of UI design Zden k Mikovec Zden k Mikovec Zden k Mikovec (Gar.)	ZK	4	2P+2S		S
XP39VIZ	Advanced Visualization Methods Ladislav molík, Pavel Slavík Ladislav molík Ladislav molík (Gar.)	ZK	4	2P	Z	S
XP39PMV	Advanced Methods of Visualization Pavel Slavík Pavel Slavík Pavel Slavík (Gar.)	ZK	4	2P+2S	Z	S
XP36POA	Advanced Parallel Algorithms	ZK	4	2P+2S	Z	S
XP37NOS	Advanced Computational Tools for Imaging and Radio Systems Stanislav Vítek Stanislav Vítek (Gar.)	ZK	4	2P+2L	L	s

XP37MSP	Advanced Multimedia Signal Processing Karel Fliegel Karel Fliegel (Gar.)	Z,ZK	4	2P+2L+3D	L	s
XP17PEM	Advanced Electromagnetism Lukáš Jelínek Lukáš Jelínek (Gar.)	ZK	3	2P+2D		S
XP34SDS	Semiconductor Structures Pavel Hazdra	ZK	3	2P	L	S
XP34SRS	Semiconductor Radiation Sources Vit zslav Je ábek Vít zslav Je ábek (Gar.)	ZK	4	2P+2C	L,Z	S
XP33PPD	Practical Data Mining Problems	ZK	4	2P+2S	L	S
XP33PAD	Probabilistic Algorithms	ZK	2	2P+0S	L	S
XP33PMD	Probabilistic Models of Uncertainty in AI	ZK	4	2P+0S	L	S
XP34ADM	Principles and Applications of Device Models Jan Voves Jan Voves Jan Voves (Gar.)	ZK	4	1P+3C+3D	Z,L	S
XP37PKP	Biomedical Engineering in Clinical Practice	ZK	4	2P+0S	L	S
XP36PAS	Algebraic Specifications Prototyping Karel Richta Karel Richta (Gar.)	ZK	4	2P+2S	Z,L	S
XP33PAM	Industrial application of multi-agent systems	ZK	4	1P+0S	L	S
XP13PSD	Flexible Production Systems	Z,ZK	4	2P+2S	Z	S
XP15PEE	Transmission of Electricity Zden k Müller Zden k Müller	Z,ZK	4	2P+2S	L	S
XP38PSL	Aircraft Instrumentation Jan Rohá Jan Rohá Jan Rohá (Gar.)	ZK	4	2P+2L	Z	S
XP38PUC	our none our none our none (our)	ZK	2		L	S
XP37RAD	Radioelectronics Pavel Ková Pavel Ková (Gar.)	ZK	4	2P+2S	L	S
XP36RSY	Reconfigurable Systems	ZK	4	2P+2S	L	S
XP35RRD	Robust Control Zden k Hurák	ZK	4	2P+2C	Z	S
XP33RSK	Robust Statistics for Cybernetics	ZK	4	2P+0S	L	S
XP33ROD	Pattern Recognition	ZK	4	2P+2S	L	S
XP04R1	Russian language 1	NIC		4C	Z,L	S
XP04R1ZK	Russian language 1	ZK	0		L,Z	S
XP04R2ZK	Russian language 2	ZK	0		Z,L	S
XP04R2	Russian Language 2	NIC		4C	Z,L	S
XP35FSC1	Flexible structures control Martin Hrom ik Martin Hrom ik Martin Hrom ik (Gar.)	ZK	4	2P+2C		S
XP35FSC	Flexible Structure Control Martin Hrom ik	ZK	4	2P+2C	Z	S
XP16JAK	Quality Management	ZK	4	2P+2S	Z	S
XP33RMD	Control of Mobile Robots	ZK	4	2P+2S	L	S
XP35CCM	Cooperative Control of Multi-agent systems Kristian Hengster-Movric	ZK	4	2P+2C		S
XP33RSP	Management of Software Projects	ZK	4	2P+1S	L	S
XP32RTS	Telecommunications Systems Management	ZK	4	2P + 2C	Z	S
XP15RE	Control of Power Systems Zden k Müller	Z,ZK	4	2P+2S	Z,L	S
XEP17SWR	Scientific Writing Milan Polivka	ZK	4	2P+2S	*	S
XPE04SCWR	Scientific Writing	Z	4	2C	L,Z	S
XP15SPS	Coupled Problems in Heavy Current and Power Engineering	Z,ZK	4	2P+2S	Z	S
XEP33VKR	Selected Topics in Pattern Recognition and Computer Vision	ZK	4	2P+2S	Z	S
XP01SPJ	Syntax and semantics of a formal language	ZK	4	2+1	Z	S
XP39SCG	Seminar in Comnuter Graohics Ji í Bittner	ZK	4	2P	L	S
XP39SPG	Computer Graphics Seminar Ji í Bittner, Daniel Sýkora Daniel Sýkora Ji í Bittner (Gar.)	Z,ZK	4	2P+2S	L	S
XP36SEP	Seminars on Architectures of Parallel Computers	ZK	4	2P	L	S
XP38SSB	Sensors and Buses Antonín Platil Antonín Platil (Gar.)	ZK	4	2P+2L	Z,L	S
XP38SSA	Ji í Novák Ji í Novák Ji í Novák (Gar.)	ZK	3	2P+1C		S
XP13SID	Software in Industrial Engineering	Z,ZK	4	2P+2C	Z	S
XP13SSD	Martin Molhanec Martin Molhanec Martin Molhanec (Gar.) Special Methods of Devices Quality Evaluation	Z,ZK	4	2P+2L	Z	S

XP37SRP	Radio Receivers Special Technology Václav Žalud Václav Žalud Václav Žalud (Gar.)	ZK	4	2P+2S	Z	S
XP13SAV	Statistic analysis and technological data evaluation Martin Molhanec Martin Molhanec Martin Molhanec (Gar.)	Z,ZK	4	2P+2S	L	S
XP02SF	Statistical Physics Antonín Krpenský Antonín Krpenský (Gar.)	Z,ZK	4	3P+1S	L	S
XP37SZS	Statistical Signal Processing Pavel Sovka, Jan Sýkora Jan Sýkora Jan Sýkora (Gar.)	Z,ZK	4	4P+0S	L	S
XP16SDE	Building heritage of the industrial era	NIC	2	4P+0S	Z,L	S
XP16STV	Product Strategy	ZK	4	0P+4S	L	S
XP36STR	Stringology	ZK	4	2P+2S	Z,L	S
XEP33SML	Structured Model Learning	ZK	4	2P+1S	L	S
XP34STV	VLSI Structures and Technologies Ji í Jakovenko Ji í Jakovenko (Gar.)	ZK	4	2P+2C	Z	S
XP15ZSS	Light sources and Equipment	Z,ZK	4	2P+2S	L	S
XP33SCD	Man-Machine Systems	ZK	4	2P+1S	Z	s
XP33SDD	Discrete Event Systems	ZK	4	2P+2S	Z	S
XP38SYS	Measurement and Data Acquisition Systems	ZK	4	2P+2L	Z,L	S
XP13SRD	Real Time Systems for Process Control Martin Molhanec Martin Molhanec Martin Molhanec (Gar.)	Z,ZK	4	2P+2C	L	S
XP13SJD	Quality Control Systems Martin Molhanec, Pavel Mach Pavel Mach Pavel Mach (Gar.)	Z,ZK	4	2P+2S	L	S
XP04S1ZK	Spanish language 1	ZK	0		Z,L	S
XP04S1	Spanish language 1	NIC	0	4C	Z,L	S
XP04S2ZK	Spanish language 2	ZK	0		Z,L	S
XP04S2	Spanish language 2	NIC	0	4C	Z,L	S
XP37TMP	Medical Instrumentation	ZK	4	2+2s	L	S
XP13TND	Technology of Low Temperatures and Superconductivity	Z,ZK	4	2P+2S	L	S
XP17TVC	Technique of Highly Sensitive Receivers Miloš Mazánek, Jan Kra ek Miloš Mazánek Miloš Mazánek (Gar.)	ZK	4	2P+2C	L	S
XP13TMD	Technological Aspects of Microcomputer Design	Z,ZK	4	2P+2S	Z	S
XP13TPD	Technological Processes in Electronic Manufacturing Karel Dušek, Pavel Mach Karel Dušek Karel Dušek (Gar.)	Z,ZK	4	2P+2L	L	S
XP34TOS	Technology of Optical Devices Václav Prajzler, Vít zslav Je ábek Václav Prajzler Václav Prajzler (Gar.)	ZK	4	2P+2C	Z,L	S
XP37TEA	Theoretical Eletroacoustics Libor Husník, Zden k Škvor Libor Husník Libor Husník (Gar.)	Z,ZK	4	3P+1S	Z	S
XP37TEM	Theoretical Electroacoustics and Measurement Libor Husník Libor Husník (Gar.)	Z,ZK	3	2P+2L	L	S
XP02TF1	Theoretical Physics 1 Antonín Krpenský, Petr Kulhánek Petr Kulhánek (Gar.)	Z,ZK	4	3P+1C	Z	S
XP02TF2	Theoretical Physics 2 Antonín Krpenský Antonín Krpenský (Gar.)	Z,ZK	4	3P+1C	L	S
XP17TOM	Theoretical Optoelectronics in Medicine Jan Vrba, Vladimír Blažek Jan Vrba Jan Vrba (Gar.)	ZK	5	2P+2C+4D		S
XP37RUP	Radio determination of position, theory and practice, experience František Vejražka František Vejražka (Gar.)	Z,ZK	5	2P+2L+2D	Z	S
XP37TAS	Acoustic signal processing and theory Václav Vencovský, František Rund, František Kadlec Václav Vencovský František Rund (Gar.)	Z,ZK	4	2P+2L	Z	S
XP01TGR	Graph Theory Marie Demlová Marie Demlová (Gar.)	ZK	4	2P+1S	Z	S
XP01TJA	Languages, Automata and Grammars Marie Demlová	ZK	4	2P+1S	L	S
XP15TOS	Theory of Light field	Z,ZK	4	2P+2S	L	S
XP32TPZ	Teletraffic Theory Petr Hampl	ZK	4	3P + 0S	L	S
XP31TSS	Signal and system theory Pavel Sovka	ZK	4	2P+2S	L	S
XP02TZP	Theory of Sound Field Ond ej Ji í ek, Milan ervenka Ond ej Ji í ek Ond ej Ji í ek (Gar.)	ZK	4	2P	Z	S
XP17TAM	Evaluation of Applicators for Microwave Thermotherapy Jan Vrba Jan Vrba (Gar.)	ZK	4	2P+2C	Z	S
XP33TTM	Text mining	ZK	4	2P+0S	Z	S
XP02UZ	Ultrasound and Quantum Acoustics Rudolf Bálek Rudolf Bálek (Gar.)	ZK	4	2P	Z	S
XP33UID	Artificial Intelligence	ZK	4	2P+1S	Z	S

XP01UAG	Introduction to Algebraic Geometry	ZK	4	2+1	L	S
XP02UEF	Introduction to Electrophysiology	Z,ZK	4	2+2s	Z	S
XP02UFL	Introduction to Laser Physics Jan Pichal Jan Pichal Jan Pichal (Gar.)	ZK	4	2P	L	S
XP37ISS	Introduction to space science and technology René Hudec, Martin Urban René Hudec René Hudec (Gar.)	ZK	4	2P+2L	Z	S
XP01UKS	Introduction to Quantum Structures	ZK	4	2+1	Z	S
XP01UNA	An introduction to nonassociative algebras	ZK	4	2+1	Z	S
XP01USA	An introduction to superalgebras.	ZK	4	2+1	L	S
XP15UEE	Electric Energy Use and Conservation Zden k Müller	Z,ZK	4	2P+2S	Z,L	S
XP13VTK	Vacuum technology and cryogenics	Z,ZK	4	2P+2S	Z	S
XP16HKC	Science, Technics and Technology in the Historic Landscape of the Czech Lands Eva Semotanová, Eva Semotanová Eva Semotanová (Gar.)	ZK	4	2P+2S	Z,L	S
XP16VTK	Everyday Science and Technology Marcela Efmertová Marcela Efmertová (Gar.)	ZK	4	2P+2S	Z,L	S
XP37VRA	Research Seminars in Radioelectronics and Acoustics	Z,ZK	4	1P+1S	Z,L	S
XP16VPB	Jan Sýkora Science, Technology and Industrial Boom	ZK	4	2P+2S	Z,L	S
V/Doov/D	Marcela Efmertová Marcela Efmertová (Gar.) Virtual reality	717		00.00		
XP39VR	David Sedlá ek, Ji í Žára David Sedlá ek David Sedlá ek (Gar.)	ZK	4	2P+2S	L	S
XP02VNP	Plasma Waves and Instabilities Petr Kulhánek	Z,ZK	4	3P+1C	Z	S
XP16DEL	History of technology and economic Marcela Efmertová, Jan Mikeš Marcela Efmertová Marcela Efmertová (Gar.)	ZK	2	0P+4S	L	S
XP37VKF	Selected Parts from Photonics Miloš Klíma Miloš Klíma Miloš Klíma (Gar.)	ZK	4	4P+0S	L	S
XP37FOT	Selected Parts from Photonics Miloš Klíma František Rund Miloš Klíma (Gar.)	Z,ZK	3	2P+2L	L	S
XP38VKP	Selected Parts of Instrumentation Jan Holub Jan Holub (Gar.)	ZK	4	2P+2L	Z,L	S
XP01TEM	Selected chapters of the measure theory Pavel Pták	ZK	4	2+1	L	S
XP33KSI	Sotware Engineering - Selected chapters	ZK	4	2P+0S	L	S
XP38VKZ	Selected Chapters of Signal Processing Jan Holub Jan Holub	ZK	4	2P+2C	L	S
XP38VDI	Selected Chapters of Diagnostics Radislav Šmíd Radislav Šmíd	ZK	4	2P+2C	L	S
XP36VPD	Selected Parts of Data Mining	ZK	4	2P+2S		S
XP01VPS	Selected topics in probability and mathematical statistics Kate ina Helisová Kate ina Helisová (Gar.)	ZK	4	2P+1S	*	s
XP33PUD	Artificial Intelligence	ZK	4	2P+2S	Z	S
XP17ANS	Selected Chapters from Antennas and Propagation Miloš Mazánek, Jan Kra ek Miloš Mazánek Miloš Mazánek (Gar.)	ZK	4	2P+2C	L	S
XP02VPA1	Selected Topics of Physics 1 Viktor Hruška, Petr Koní ek Petr Koní ek Viktor Hruška (Gar.)	ZK	4	2P	Z	S
XP02VPA2	Selected Topics of Physics B Viktor Hruška	ZK	4	2P	L	S
XP02VPB	Selected Topics of Physics B Viktor Hruška	Z,ZK	4	2+2s	L	S
XP02VPO	Selected Topics of Optics Antonín Krpenský, Josef Kravárik Josef Kravárik (Gar.)	Z,ZK	4	2P+2S	Z	S
XP33ROZ	Selected Topics in Pattern Recognition	ZK	4	2P+2S	L	S
XP16MVE	Selected Problems of Economy and Management of Energy	ZK	4	2P+2S	L	S
XP37SFA	Fundamentals of Physical Acoustics	ZK	4	1+0s	L	S
XP16STM	Selected Statistical Methods Šerzod Tašpulatov Šerzod Tašpulatov Šerzod Tašpulatov (Gar.)	ZK	4	2P+2S	L,Z	S
XP36VAV		ZK	4	2P+2C		S
XP39VPG	Computational Geometry Petr Felkel Petr Felkel (Gar.)	ZK	4	2P+2S	Z	S
XP36VAP	Advaced Computer Architecture	ZK	4	2P+2S	Z	S
XP12VVM	Development and Research of Materials	Z,ZK	5	3+2s	L,Z	S
XP13VVM	Development and Research of Materials	Z,ZK	4	2P+2S	L,Z	S
XP16VTS	Development of Technical Universities Martina Be vá ová Martina Be vá ová (Gar.)	ZK	4	0P+4S	Z,L	S

XP13VNM	Research of new materials	Z,ZK	4	2P+2L	Z	S
XP15VME	Research Methods in th Use of Electrical Energy Jan Kyncl, Ivo Doležel Ivo Doležel (Gar.)	Z,ZK	4	2P+2S	L	S
XP02ZFP	Fundamentals of the Plasma Physics Stanislav Pekárek Stanislav Pekárek (Gar.)	ZK	4	3P	Z	s
XP33KHD	Introduction to Game Theory	ZK	4	2P+1S	Z	S
XP33ZPM		ZK	4	1P+1S	L	S
XP33ZVD	Introduction to Computer Vision	ZK	4	2P+2S	Z	S
XP33POS	Fundamentals of Possibilistic Measures	ZK	4	2P+0S	L	S
XP33TPS	Foundations of the Possibilistic Measures	ZK	4	2P+0S	L	S
XP01ZOA	Fundamentals of the theory of operator algebras	ZK	4	2+1	Z	S
XP16ZVP	Fundamentals of Scientific Work Marcela Efmertová Marcela Efmertová Marcela Efmertová (Gar.)	ZK	4	2P+2S	Z,L	S
XP01ZWT	Wavetet Transform.	ZK	4	2P+1S	L	S
XP37ZI	Information recording František Kadlec	Z,ZK	4	2P+2S	L	S
XP34RSD	Radiation Saurces and Photodetectors for Integration Vít zslav Je ábek	ZK	4	2P	L	s
XP33ZDD	Processing of Biological Data	Z,ZK		2P+0S	Z	S
XP31ZBS	Biological Signal Processing Roman mejla, Jan Rusz, Radek Jan a, Jan Sedlák, Petr Ježdík Pavel Sovka Roman mejla (Gar.)	ZK	4	2P+2C	Z	S
XP37ZSN1	Signal processing in satellite navigation systems 1 František Vejražka František Vejražka (Gar.)	Z,ZK	4	1P+3S	Z	S
XP37ZSN2	Signal processing in satellite navigation systems 2 František Vejražka František Vejražka (Gar.)	Z,ZK	4	1P+3L	L	S
XP33VID	3D Computer Vision Radim Šára Radim Šára Radim Šára (Gar.)	ZK	4	2P+2S	Z	s
Characteristics o	f the courses of this group of Study Plan: Code=PKKPPP Name=C	compulsory fa	acultativ	etudy		
XP02AME	Active Methods in Acoustics				ZK	
XP02AMA	Active Methods in Acoustics			2	ZK	4
	erference, Huygens principle, sound field in ducts, vawe-guides and enclosures. Active nois			,		
	coupling, modes, local control. Feedback and feedforward strategy, analog adn digital realism	ations, algorithms	based on I	.MS, stability o	f algorithms,	, multichar
	ealisations of active systems. Active control of vibrations, transducers for active control.					
XP37AEM	Acoustic and Electroacoustic Measurements			Z	ZK	4

XP02AME	Active Methods in Acoustics	ZK	
XP02AMA	Active Methods in Acoustics	ZK	4
Physical principles,	interiference, Huygens principle, sound field in ducts, vawe-guides and enclosures. Active noise control in a duct. One or more s	econdary sources	. Active control
in enclosures, acou	stic coupling, modes, local control. Feedback and feedforward strategy, analog adn digital realisations, algorithms based on LMS,	stability of algorith	ms, multichann
algorithms. Practica	I realisations of active systems. Active control of vibrations, transducers for active control.		
XP37AEM	Acoustic and Electroacoustic Measurements	Z,ZK	4
Measurement of ac	oustic pressure, measuring microphones. Measurement of acoustic impedance. Foundamental audiometric measurements, artif	icial ear. Measure	ment of acoust
power. Methods of	calibration of measuring microphones. Method of reciprocity. Method of reciprocity in the field of the spherical wave, in the diffusio	on sound field. Cal	ibration metho
for accelerometers	and sensors of velocity and displacement. Measurement of mechanical impedance, impedance head, artificial mastoid. Electros	tatic transducer ar	nd its application
for electroacoustic	neasurements. Measurement of thin membranes and air-gaps. Acoustic intensity measurement. Measurements of acoustic tran	smitters.	
XP37APF	Acoustics and Electroacoustics of Solid State	Z,ZK	4
Waves in elastic iso	ptropic unbounded continuum. Wave equation. Scalar and vector potential. Plane harmonic uniform and non-uniform wave. Ene	rgy and power in p	lane harmonic
wave. Plane wave i	n half-space, reflection and refraction of a plane wave at an interface between too solids. P-wave, SV and SH waves. Rayleigh w	aves. Waves in wa	ve -guides in
solids. Wave propa	gation in cylindrical wave-guide. Solid-state waveguides of non-uniform cross-section. Piezoelectricity. Equivalent circuits of piezo	electric transduce	rs for generati
of volume and surfa			
XP37AR	Speech Acoustics	ZK	4
Vocal tract, anatom	y, physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech		
XP31ASN	Algorithms and Structures of Neurocomputers	ZK	4
Information about t	ne basic principles and possibility of the application of the neural informative technology for the signal processing are the main to	1	are devoted to
	ne basic principles and possibility of the application of the neural informative technology for the signal processing are the main to the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural	opic. The lectures	
the introduction into		opic. The lectures a network application	
the introduction into processing are inve	the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural	opic. The lectures a network application	
the introduction into processing are invented XP34AIC	the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural	ppic. The lectures a network application escribed.	ons at the sign
the introduction into processing are inve XP34AIC Functional structure	the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural stigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail.	popic. The lectures and network application of the population of t	ons at the signa
the introduction into processing are inve XP34AIC Functional structur processes. Advanc	the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural stigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail. Some neural network applications in the biomedical engineering and hardware realization of the structures and the neural stigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail.	popic. The lectures and network application of the population of t	ons at the signa
the introduction into processing are invex XP34AIC Functional structure processes. Advance XP31AEO	the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural stigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in the IC's. Bipolar and unipolar structures. BiCMOS structures. 3D structures. Sub-micron structures. Memory structures. Tested semiconductor technology. IC design, design of technology. Design rules. Reliability, yield. Outlooks and limitations of IC development.	opic. The lectures anetwork application secribed. ZK ting structures. VL: lopment	3 SI technologic
the introduction into processing are invex XP34AIC Functional structure processes. Advance XP31AEO Circuit models of d	the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural stigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the choice and the optimisation of the structures and the neural stigated in detail. Some neural network applications, to the choice and the optimisation of the structures and the neural stigated in detail. Some neural network applications, in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications, in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are detailed in detailed in detailed in detail. Some neural network applications in the	ppic. The lectures an etwork application per policies of the secretary and the secre	ans at the sign 3 SI technologic 4 eriodic steady
the introduction into processing are invex XP34AIC Functional structure processes. Advance XP31AEO Circuit models of distate analysis. Ana	the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural stigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are described seriously and unipolar structures. BicMoS structures. 3D structures. Sub-micron structures. Memory structures. Tested semiconductor technology. IC design, design of technology. Design rules. Reliability, yield. Outlooks and limitations of IC developments. Circuit Analysis evices and structures. Methods of analysis and algorithms for linearized circuit models in time domain and frequency domain. Traysis of nonlinear circuits in time and frequency domains. Parametric models. Circuits with non-linear energy storing elements.	ppic. The lectures an etwork application per policies of the secretary and the secre	3 SI technologic 4 eriodic steady
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program .

XP04A1			
	English language 1	NIC	
_	eral English from previous studies, further develops speaking skills, listening and recalling spoken English as well as note-tak	king skills. Provide	s basic scientific
<u> </u>	ct relationship, definitions, classification, basic information on composing written documents).		
XP04A2	English language 2	NIC	
	ritten documents (papers, reports, articles, dissertations, official letters); oral presentations, reading skills (getting both generally in a facility of the property of the second second in the second s		
writing CV). Oral preser	eech in a foreign language ; selected parts of difficult grammar; selected items focused on practical skills (reading mathemat	icai symbols and e	expressions,
		71/	
XP04A2ZK	English language 2 postgraduate students who study in older program valid up to Sept.2003 and did not ask for studying the new language pro	ZK	0
XP34AT		ZK	4
	TCAD Tools Applications mputer-aided technological design. Device simulators Atlas and Sentaurus: principle, applications. Basic equations. Boundar	1	•
	Avalanche ionisation models. Mobility models. Hands-on exercises on SUN workstations according to the tasks of students'	•	encarmetrious.
XP37AEA	Applied Electroacoustics	ZK	4
	ns in acoustics, modeling of miniature acoustic elements in thermoviscous fluid, equivalent circuits based approximation, rev	1	•
	ransmitters and receivers, waveguides for transducers, membranes and plates in transducers, modeling of coupling between		
	tatic microphones and their models, MEMS microphones.		•
XP32AKR	Applied Cryptography	ZK	4
-	aphy.Mathematics Foundations of Cryptography.Related Problems of Number Theory.Public Key Parameters. Pseudorandor	1	=
Ciphers. Block Ciphers.	Public Key Enciphering. Hash Functions and Data Integrity. Entity Identification and Autentication. Digital Signatures. Key Manag	ement Protocols.K	ey Management
Techniques.Effective Im	plementations of Supporting Algorithms. Patent Pendings and Standards.		
XP17APL	Applied Optoelectronics in Medicine	ZK	4
Scope and aims of non-	invasive measurement techniques in medical diagnostics. Fundamental physiology of the vascular system, hemodynamics,	skin anatomy and	perfusion.
Computer simulation of	the cardiovascular system. UV, VIS and IR spectroscopy. Fundamental optics of the eye and color analysis. Optical parameter	ers of biological tis	sue. Dispersion
of light, Design of optical	al sensors, Optical visualisation principles of translumiscetion and tomography, Optoelectronic systems in medicine.		
XP36ASP	Architecture of Symbolic Computers	ZK	4
Symbolic expressions a	nd abstract programs, lambda calculus, formal basis for abstract programming, self-interpretation, SECD abstract machine, mer	mory management	, demand-driven
evaluation, Lisp impleme	entations, predicate logic and its inference engine, Prolog inference engine and dynamic algebras, Warren abstract machine, opi	timisation, Prolog i	mplementations,
parallel inference engine	98.		
XP37ARA	Architectural Acoustics	ZK	4
	al and statistical acoustics. Acoustical lining and sound absorption. Objective room acoustic parametres. Subjective criteria f		
	technique. Physical modelling and numerical simulation of sound propagation. Electroacoustic sound reinforcement. Acoustica		
	on. Simple and complex constructions. Criteria for sound insulation properties of building constructions. Measurement in acou	stics of construction	ns. Calculations
in room acoustics.			
XP31ART	Architectures for Real Time Implementation	ZK	4
	processing units and synthesis of data paths for DSP. Implementation strategies of DSP algorithms. Influence of algorithm m		implementation
l ·	ntial and parallel processing. Numerical characteristics of algorithms. Implementation alternatives, dedicated hardware and printing processors with fixed point and fleating points. Developments tools for real time processing. Applying of real time implements		-
Architectures of digital s	ignal processors with fixed point and floating points. Developments tools for real time processing. Analysis of real time imple		•
Architectures of digital s special algorithms for co	ignal processors with fixed point and floating points. Developments tools for real time processing. Analysis of real time imple	mentation of FFT,	digital filters and
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WP33RCV Reading group in Pattern Recognition and Computer Vision The course deals with fundamental results in computer vision and pattern recognition. It targets the detailed study of principles which substantially influence the developmer field. The course is performed in the form of a reading group. Each time, a person in charge presents a paper and the reading group participants join in with questions, common discussion about the paper. The Reading group meetings are online and scheduled either on Tuesdays, or on Thursdays, from 11am (lasting 60-90 mins). XP13DFD Data and Functional Analysis of Production Systems Z,ZK Technological system of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information of enterprise, distributed Methodology of analysis of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of data and material flows Methods of analysis of user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise. Use of Petri nets for an enterprise. Documentation and standards for data and functional analysis. Automation of analysis methods, CASE tools. XP13DEZ Degradation processes of electridal equipment ZK ZK Common processes of electridal equipment CASE tools CASE	4 systems. analysis.
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enterprise. Documentation and standards for data and functional analysis. Automation of analysis methods, CASE tools.	liysis of
XP13DEZ Degradation processes of electridal equipment Z,ZK	
The course familiarizes students with the basic processes of degradation, which is exposed to the electrical product in a production environment. The student will apply this k	4 nowledge
to a specific product for a model operating environment. The student should try to verify the dominant degradation process of the product in the laboratory or perform its con-	- 1
simulation. Attention is also paid to environmental aspects associated with the choice of materials (technology) that are able to limit the degradation process. XP16HPH History of Physic ZK	4
XP34ORD Optical Radiation Detection and Detectors ZK	4
Spectrum of electromagnetic radiation, radiometric and photometric units. Detection of optical radiation. Ideal detectors, internal and external photo-effect. External photo-effect photomultipliers. Internal photo-effect detectors, PN junction. PIN photodiode, physical principles, properties. Avalanche photodiode, physical principles, properties.	
physical principles, properties. Thermal energy conversion detectors. Bolometers, thermocouples. Pyroelectric detectors. Some other detector types. Optical receivers, design	
properties, noise. Solar cells, properties. Measurement methods, applications.	
XP36DRO Diagnostics and Reconfiguration of Programmable Circuits ZK The subject is aimed to help PhD students to understand better methods of reliability and availability improvement of SOC and NOC circuits built on FPGAs and ASICs.	4
XP34DTM DIAGNOSTICS AND TESTING IN MICROELECTRONICS ZK	3
XP15DVN Diagnostics of HV and EHV Insulating Systems Z,ZK	4
Failure rate of operation, fault sources and mechanisms. Indoor and outdoor insulation of electrical equipment. Diagnostic methods, using in operation. Choice of methods for	٠ ا
systems. Application of database systems for electrical machines and equipment of HV and EHV. Application of systems with element of artificial intelligence in electro diagrams. XP02DP Electric Discharges and their Applications ZK	ostics.
Classification of electric discharges. Townsend's theory. Glow discharge. Processes on the surface of electrodes. Technological applications. Plasma displays. High-frequen	-
microwave discharge. Arc. Corona. Spark discharge. Lightning. Ball lightning. Z-pinch and its properties. Electromagnetic collapse. X-ray sources, controlled fusion. Generati	on of
magnetic fields of Earth.	
XP13DTF Thin film diagnostics Z,ZK Surface characterization. Definition of a thin film. Deposition methods; chemical vapor deposition, physical vapor deposition. Thin film characterization: optical methods; elec	4 ron
diffraction. Ion implantation. X-ray diffraction and photoelectron spectroscopy. Thickness, mechanical, optical and electrical properties.	
XP32DZS Digital Signal Procesing in Telecommunications ZK	4
XP32DKS Sizing of communications networks ZK	4
XP33DID Distributed Artificial Intelligence ZK	
	4
In winter semester 2023/24 the course runs for the last time. In future years, it will not be opened anymore. Distributed problem solving. Multiagent planning. Cooperation. Coommunication. Communication strategies, message passing. Various AI approaches, case studies. Types of agent behavior. Negotiation. Organizational structuring. Partial	4 ordination.
Communication. Communication strategies, message passing. Various AI approaches, case studies. Types of agent behavior. Negotiation. Organizational structuring. Partial planning. Blackboard systems. Client-server systems. Peer-to-peer systems. Implementation aspects of distributed knowledge-based systems. Learning in multiagent systems.	4 ordination. global
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XP01EKM	Mathematics Models for Economics	ZK	4
	uction to the theory of time series and random processes used in economics for describing values (financial assets, product e shown. Further, the terms of stochastic differential and stochastic integral are introduced.	prices, financial los	ss) randomly
XP16ERU	Accounting	ZK	4
Principles of accounting	. International accounting standards (IFRS). Methodology of accounting. Cost, revenues, profit and cash flow. Balance sheet,	, profit and loss ac	count. Analysis
of company's financial p			
XP16EKO	Economics	ZK	4
	Principles of microeconomics, consumer behaviour and producer behaviour. Profit maximization. Perfectly competitive marke nomics, aggregate demand and aggregate supply. Labour market. Money market and capital market. Macroeconomic policy c		
•	g the market. Comment: The subject is a necessary precondition for understanding other economic and managerial discipline	_	as a laste.
XP16MES	Economics and Management of Energy Systems	ZK	4
	lectric power sector, gas systems and central heating systems functions. Marginal revenue in electric power system. Marginal		- 1
	ation, subsystem and system optimization in generation and transportation of different kinds of energy. Reliability in energy d py price regulation and its consequences	Jelivery. Internation	nal cooperation
XP16EME	Economics and Management of Energetics	ZK	4
-	of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and tariffs	s of energy. Govern	nmental energy
· · · · · · · · · · · · · · · · · · ·	nternational cooperation in power industry and its economic and ecology aspects.	714	
XP16MEU	Economics and Management of Energetics of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and tariffs	ZK	4
-	nternational cooperation in power industry and its economic and ecology aspects.	s or energy. Govern	illiental energy
XP16EPM	Economics of power markets	ZK	4
The subject provides ba	isic theoretical knowledge about the organization and functioning of electricity markets. The starting point is the theory of sho	ort- and long-term	marginal costs
_	e electricity supply curve. This is followed by the theory of integration of electricity markets and the creation of economic welfa		
· -	d to decarbonise and integrate electricity markets. This, together with the massive rise in electricity from intermittent sources, r markets and new business models including demand response and the development of the prosumers concept (where end		
-	Part of the subject is also discussion of other links of the electricity market - emission allowances, connection to the heat mark		-
XP16ERE	Economics of power generation from RES	ZK	4
The subject focuses on	complex problems of economy of production of electricity and heat from renewable energy sources. The course develops the	acquired knowled	dge in the field
_	at due to the specifics of electricity / heat generation from RES and the expected development of energy markets. Consequent	-	
	ty market, taking into account current trends in the decentralization of energy systems, decarbonisation of energy and the expe ricity market. These trends require the development of different types of energy accumulation and the implementation of smari		- 1
	ne course also includes modeling of the development of energy systems with high RES share.	t teermologies in ti	ie management
XP37ELA	Elastoacoustics	ZK	4
The course deals with in	nteractions of elastic structures with gaseous medium, namely vibrations of plates, radiation impedances, modal equations, in	nfluence of walls s	urrounding
	ement method, calculation of eigenfrequencies.		
XP15ES	Electrical Lighting	Z,ZK	4
= =	es. Light micro climate design. Daylight, artificial and mixed lighting. Visual performance. Visual comfort. Colorimetry. Light sol or and interior lighting. Lumen method. Integrated and remote controlled lighting systems.	urces. Luminaire d	maracteristics.
XP15ET	Electroheat	Z,ZK	4
-	nental equations of heat and mass transfer in electromagnetic field in continuum. Thermal effects of electromagnetic field. The		problems of
	arc heating. Similarity and analogy of equations and their use. Numerical methods in electroheat.	 	
XP02EVA	Physics for Electroenergetics	ZK	4
	d parts of physics for students of electric power engineering: Physical principles of gas discharges - glow, arc, spark and corona cquainted with characteristics for magnetized, astrophysical and fusion energy generation. A part of the course is two excursio	•	
Academy of Sciences.	oqualified with characteristics for magnetized, astrophysical and rusion chorgy generation. A part of the course is two execution	TIS III IADOI ALONGS	OTO and Ozcon
XP34ETS	Electrical Transport in Semiconductors	ZK	4
Electron and hole transp	ort in semiconductor crystals. Effective mass, mobility Boltzmann's transport equation. Scatter mechanisms, frequency. Scatteri	ing on phonons, ior	nised impurities,
=	xation time approximation Carrier transport in a strong electric field, velocity saturation. Carrier transport in magnetic field. Carrier transport in magnetic field.		
	nsport, density matrix, Green's and Wigner's functions. Resonance tunnelling, transport of electrons in superlattices. Single e port. Quantum Hall's effect. Simulation of transport effects.	ectron transport,	Coulomb's
XP17ELD	Electrodynamics	ZK	4
XP14EMC	Electromagnetic Compatibility	ZK	4
	terference coupling. Shielding. Earthing. Nonlinear consumers. Harmonics in electric convertors in steady and transient cond	itions. Supression	of negative
	the network. Compensation and filtration.		
XP14ECD	Electromagnetic Compatibility	ZK	4
	fferent manner and coupling factors of interference spreading. Grounding influences. Screening. Non-linear electric appliance ns of different electric appliances. Harmonic current and voltage components of different electric appliances. Steady state an	· · · · · · · · · · · · · · · · · · ·	
-	Interference suppression of converters on the network. Compensation and filtration substations.	a transfer carren	and vollago
XP38EMC	Electromagnetic Compatibility of Data Acquisition Systems	ZK	4
	surement of electromagnetic emission and immission. EMC standards. Modelling of disturbing signals. Electromagnetic distu	irbance in laborato	ory and industry.
	with regard to EMC. EMC of data transmitting lines.	7 71/	
XP15EH	Energy Economy f national economy.Terminology of energy economy.The energy systems. Forecast of energy consumption.Energy balance in	Z,ZK	4 Energy balance
	ir national economy, terminology of energy economy. The energy systems, Porecast of energy consumption, Energy balance in Inomy and its impact to environment. Energy economy on the organization level. The control of energy economy. Basic proble		
XP15EZP	Control in Power Engineering	Z,ZK	4
Overview of environment	al problems. The role of power engineering. Global climate change. The greenhouse effect. Carbon dioxide emissions.Impact	t of nuclear power	
	Renewable energy sources. Methods and technology for decreasing of impact to environment. Electric power transmission and	d the environment.	The control of
power energy system	Evalution on Computing	71/	A
XP33ECD Introduction to evolution	Evolutionary Computing ary computing in contrast to classical computing techniques, Genetic algorithms (GA) for optimisation. The Simple Genetic A	ZK Ngorithm (SGA) an	4 d its behaviour
	tive phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typica		
	s. Special methods for improving GA performance.		

XP15EXE	Expert Systems in Electrical Power Engineering	Z,ZK	4
	Expert Systems in Electrical Power Engineering valuation. Expert systems in electrical power engineering and diagnostics of insulating systems. Application of rule-based ex	1 ' 1	•
	neering and diagnostics of insulating systems. Creation of expert systems for electrical power engineering and electro diagr	-	iculai network
(P16FVT	Philosophical Problems of Science and Technology	ZK	2
he course is engaged	in the evolution of principal ideas on which the science and technology are founded. Philosophical aspects of physics and r	1 1	eper examined
ctual themes linked t	the so called "Postmodernism" and to the alternative ways of understanding and their social coherences are discussed.		
(P16FIM	Financial Management	ZK	4
	resent value and alternative cost of capital, net present value, present value of bonds and stocks, investment decision makin	•	
(P31FSK	al, risk and return, lease or buy decision, inflation and return, real options, financial options, option valuation, hedging, short	ZK	
	Phonetic signals and their coding the processing of speech signals. Within the subject students should manage from basic to advanced and modern algorithm	1	4 sis synthesis
=	the processing of speech signals. Within the subject students should manage from basic to advanced and modern algorithm. It. Further reasonable part is focused on speech recognition, where students will get to know modern and advanced technique in		-
=	speaker recognition. Special attention is devoted to usage of classification techniques based on GMM, DTW, HMM, ANN/DN		-
P31FON	Speech Phonetics and Advanced Voice Technologies	ZK	4
(P15FAK	Photometry and Colorimetry	Z,ZK	4
rinciple of photometr	methods. Standards of luminance and luminous flux. Receivers of radiation and modification of their characteristics. Photol	metric distance. Me	asurement of
-	s. Luminaire parameters. Measuring of indoor lighting systems. Measuring of outdoor luminance and illuminance. Colour visi	on theory. Chromati	city. Colour.
	our rendering-index. Chromaticity system.Diagram of chromatic. Colorimeter. Spectroscop		
P37FOS	Photonic Imaging Systems	ZK	. 4
-	tation. Energetic image description. Principles of image acquisition, transferring and storing. Image entropy function, 2 dime		
, ,	ription. Novel compression techniques. Image reproduction, matrix description. Light diffraction. 2D transfer functions - PSF, i transfer systems and their signal distortion, image aberration and their correction, toleration analysis of optical system. Rece		
•	rocessors, computers and memories.	5.5 and nanonille	opooiai
(P13FCD	Photovoltaics systems	Z,ZK	4
	the most important problems of principle, technology of production and final use of photovoltaic systems for power generation	1 ' 1	ergy and basic
•	n. Photovoltaic effect, photovoltaic cells. Optimization of cell structure in terms of optical and electrical properties of individual	•	
	rmination of the maximum theoretically achievable energy conversion efficiency of a given structure. Photovoltaic modules. Tea		=
	oltaic cells and modules. Characterization and diagnostic methods, analysis of failure types, influence on durability. Photovoltai		
P04F1ZK	ts of photovoltaic systems. Simulation of yield for a given type of climate and season. Trends in applications of photovoltaic s	·	•
	French language 1	ZK	0
P04F1	French language 1 Immar and vocabulary, with the emphasis on technical style ; ability to understand technical texts on an intermediate level (NIC	22 60 pages o
	ns - ability to talk on subjects studied by the postgraduate student. Writing cover letters , CV, answering advertisements etc.	lested on reading co	a oo pages c
(P04F2ZK	French language 2	ZK	0
P04F2	French language 2	NIC	
–	poth in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficu	1	prehension of
exts (cca 120 pages).	Oral presentations, i.e. ability to talk about problems on a sufficiently good level, (both language and content level studied by p	oostgraduates). Mas	tering langua
kills related to job app	lications, cover letters etc.		
(P01FA1	Functional Analysis 1	ZK	4
	besgue integral. An introduction to Hilbert spaces. Theory of linear operators in Hilbert spaces. Spectral theory.		
(EP33FLO	Fuzzy Logic	ZK	4
	d fuzzy logic. Measures on collections of fuzzy sets. Principles of fuzzy control.	714	
(P33FLO	Fuzzy Logic	ZK	4
	d fuzzy logic. Measures on collections of fuzzy sets. Principles of fuzzy control.		
	Frank Madalling and Cantral	71/	
P35FMD	Fuzzy Modelling and Control	ZK	4
P35FMD he goal of the subject	is to introduce the up-to-date trends and results in the area of modelling and control of nonlinear systems based on fuzzy logic	and neural network	ks. This includ
P35FMD he goal of the subject specially analysis and	, ,	and neural network	ks. This includ
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XP34ASD	Physics of Advanced Semiconductor Devices and Materials	ZK	4
Modern semiconductor	devices and integrated circuits are based on unique energy band, carrier transport, and optical properties of semiconductor m	aterials. Students	will be prepared
	ies for operation of semiconductor devices. Emphasis is on quantum mechanical foundations of the properties of solids, ene	0, 0, 0	Ο,
	s, semi-classical transport theory (Boltzmann transport equation), carrier scattering, electro-magneto transport effects, high fi	-	
	e and non-radiative recombination. These princliples will be studied on the experimental basis as well. Students will prepare will characterise them during their individual projects	own structures ac	cording their
XP13FPD	Semiconductor Physics	Z,ZK	4
The aim of the course is	to deepen the knowledge of the properties of semiconductor materials and structures that are important for a deeper under	standing of the se	emiconductor
components technology			
XP02FPT	Physics for Therapy	Z,ZK	3
	to Over Using Syndrome problems. Besides that, there will be discussed pain treatment for patients with cancer. A significal erapy and phototherapy. Also healing processes, organ conservation methods and progressive surgery methods will be spoken.		
many practical knowledge		teri about. Studeri	ts will also gaill
XP37FHA	Physiological, Psychological and Musical Acoustics	ZK	4
	organ, hearing theory, hearing field, loudness, masking, pitch of sound, temporal tresholds, distortion in the hearing organ, a	1	and impairment
of hearing system. Bina	ural hearing, objective and subjective properties of musical signals, statistical and dynamical analysis. Perception of simple to	ones and complex	k sounds,
-	ancy. Psychoacoustics of transmission of the musical signal. Methods of psychoacoustic measurements, their validity, repeat	tability. Planning a	ind realization
	ds of statistical analysis of results, interpretation.	71/	
XP37FHA1	Physiological, Pychologycal and Musical Acoustics 1 gnal in temporal and frequency domains, methods of sound synthesis, timbre and interpretation of sound spectra, objective a	ZK	4
	on to acoustics of speech and singing, physicalacoustic principles of musical instruments, tuning, dynamics, timbre of the to		· ·
	n to methodology of measurement of musical instruments.	,	o. 1.00 odo.ou.
XP37FHA2	Physiological, Psychological and Musical Acoustics 2	ZK	4
Properties of musical sign	gnal in temporal and frequency domains, methods of sound synthesis, timbre and interpretation of sound spectra, objective a	assessment of tim	bre, theory of
sound quality, introduction	on to acoustics of speech and singing, physicalacoustic principles of musical instruments, tuning, dynamics, timbre of the to	ne, radiation prop	erties of musical
	n to methodology of measurement of musical instruments.		
XP37GAB	Genesis and Analysis of Biosignals	ZK	4
, ,	enesis and description of the most important biological signals of both electric and non-electric nature. Properties of the biosign		ne consequential
	tudied. Finally, simple and advanced methods of biosignals pre-processing, analysis and evaluation are presented for each t		4
XP33GAD	Geometrical Algebras and linear spaces, ordered groups and fields, othogonal groups, Clifford algebras, etc. Discussion of	ZK	•
processing.	a in goomony. Groupe and initial opacios, ordered groupe and notes, emegenia groupe, emerc algebras, etc. Discussion of	potoritical applica	aono in imago
XEP33GMM	Graphical Markov Models	ZK	4
The course was taught i	n WS 2023/24 for the last time. It will not be opened anymore. Markov models on graphs represent a model class widely app	olied in many area	s of computer
science, such as compu	ter networks, data security, robotics and pattern recognition. The first part of the course covers inference and learning for Ma	arkov models on o	chains and trees.
_	structure learning can be solved by efficient algorithms. The second part addresses graphical models on general graphs. He	ere on the contrar	y, practically all
	asks are NP-complete. The focus is therefore on efficient approximative algorithms.	NIIO	
XP16HKA	Historical structures and technologies in architecture	NIC	2
XP16HKA XP16HDS	Historical structures and technologies in architecture History of Transport Systems and Communications	ZK	2
XP16HKA XP16HDS XP16HEL	Historical structures and technologies in architecture History of Transport Systems and Communications History of Electrical Engineering	ZK NIC	2
XP16HKA XP16HDS XP16HEL XP16HIS	Historical structures and technologies in architecture History of Transport Systems and Communications History of Electrical Engineering Historiography of the Development of Science, Technology and the Methodology	ZK NIC ZK	2 2 4
XP16HKA XP16HDS XP16HEL XP16HIS XP02HS	Historical structures and technologies in architecture History of Transport Systems and Communications History of Electrical Engineering Historiography of the Development of Science, Technology and the Methodology Noise Surveys	ZK NIC ZK ZK	2 2 4 4
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XP16HKA XP16HDS XP16HEL XP16HIS XP02HS Sound field, noise and v sources. Noise in working	Historical structures and technologies in architecture History of Transport Systems and Communications History of Electrical Engineering Historiography of the Development of Science, Technology and the Methodology Noise Surveys ibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise magenivironment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control.	ZK NIC ZK ZK appping, principles	2 2 4 4
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XP16HKA XP16HDS XP16HEL XP16HIS XP02HS Sound field, noise and v sources. Noise in workir XP36HS Hypermedia systems, b topics and the ways out XP37IAR PhD students' education more arithmetic units (u computational complexir XP33IMD Medical data processed Requirements on inform systems and their applic Computer aided therapy XP01ITZ Basic types of integral tr distribution theory, Fouriequations. XP34IO Light propagation in way and interactions for IO. If electro-optical and therr optical amplifiers. Optica optics application. XP12IMM Review methods solution of vectorial and analytic energy losses. Physical XP36JAI	Historical structures and technologies in architecture History of Transport Systems and Communications History of Electrical Engineering Historiography of the Development of Science, Technology and the Methodology Noise Surveys ibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise m genvironment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control. Hypermedia Systems and Internet Computing asic models. Intelligent searching, adaptive navigation, personalization of access to web applications. Web intelligence, semi- Internet computing. Modern technologies for web applications design. Implementation algoritms in radioelecronics and their research activities are focused on the problems of effective implementation algorithms in radio electronics by sign niversal and signal processors) and with support hardware accelerators in FPGA circuits. Optimization of the algorithm is control to the signal processors and with support hardware accelerators. Informatics in Clinical Medicine by automatized systems. Specific problems of medical informatics. Computer supported documentation in doctor's work. He attoin system projects from the point of view of medicine. Introduced hospital information systems. Diagnosis theory, computer action in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in medicine in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in medicine in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in medicine. Specialized computer networks. Integral Transforms and Z Transform ansforms, linearity, Laplace transfor	ZK NIC ZK Anapping, principles ZK antic web. Web er Z,ZK antic web. Web er Z,ZK antic processors, proncentrate on minin ZK antic diagnosis. K netabolic and inte ZK netabolic and inte ZK s. Fundamental pice structures. Electronductor integraters of nanophotonic Z,ZK bined systems with pect to passive reserved.	2 4 4 4 5 and types of 4 1 gineering, main 4 1 pocessors with malisation 4 1 systems. 1 nowledge-based nsive care. 4 1 troduction to m and difference 4 1 hysical effects ro-absorption, d structures, s and integrated 4 h using methods sistances and 4
XP16HKA XP16HDS XP16HEL XP16HIS XP02HS Sound field, noise and viscources. Noise in workin XP36HS Hypermedia systems, but topics and the ways out XP37IAR PhD students' education more arithmetic units (ucomputational complexin XP33IMD Medical data processed Requirements on inform systems and their applic Computer aided therapy XP01ITZ Basic types of integral tradistribution theory, Fouriequations. XP34IO Light propagation in way and interactions for IO. If electro-optical and therroptical amplifiers. Optical amplifiers. Optical optics application. XP12IMM Review methods solution of vectorial and analytic energy losses. Physical XP36JAI The course offers a dee	Historical structures and technologies in architecture History of Transport Systems and Communications History of Electrical Engineering Historiography of the Development of Science, Technology and the Methodology Noise Surveys historioment, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise m genvironment, Noise in buildings. Transport noise, airport noise. Technical principles of noise control. Hypermedia Systems and Internet Computing asic models. Intelligent searching, adaptive navigation, personalization of access to web applications. Web intelligence, semi- Internet computing. Modern technologies for web applications design. Implementation algoritms in radioelecronics and their research activities are focused on the problems of effective implementation algorithms in radio electronics by sign niversal and signal processors) and with support hardware accelerators in FPGA circuits. Optimization of the algorithm is con- typ by utilization multirate digital signal processing and hardware accelerators. Informatics in Clinical Medicine by automatized systems. Specific problems of medical informatics. Computer supported documentation in doctor's work. He ation system projects from the point of view of medician Introduced hospital information systems. Diagnosis theory, computer a tation in medicine. Database systems, she wide medicine. Introduced hospital information systems. Diagnosis theory, computers in replanning. Standardiyation and communication between information systems in medicine. Specialized computer networks. Integral Transforms and Z Transform ansforms, linearity. Laplace transform, inversion, limit theorems. Fourier transform. Application to solving integral and difference are and Laplace transforms of distributions. Linear dynamic systems, causality, passivity, convolution. Systems with bounded special and papace transforms of distributions. Linear dynamic systems, causality, passivity, convolution. Systems with bounded special and preparation of	ZK NIC ZK Anapping, principles ZK antic web. Web er Z,ZK antic web. Web er Z,ZK antic processors, proncentrate on minin ZK antic diagnosis. K netabolic and inte ZK netabolic and inte ZK s. Fundamental pice structures. Electronductor integraters of nanophotonic Z,ZK bined systems with pect to passive reserved.	2 4 4 4 5 and types of 4 1 gineering, main 4 1 pocessors with malisation 4 1 systems. 1 nowledge-based nsive care. 4 1 troduction to m and difference 4 1 hysical effects ro-absorption, d structures, s and integrated 4 h using methods sistances and 4

XP33CHM	Chapters in higher mathematics	ZK	4
	several deeper results in a few mathematical disciplines. The idea is to help a student to read, with a certain comfort, the morents of the course are fundamental results (principles) of nowadays mathematics. More specifically, the course concerns the		
	pplied in mathematical logics and probability theory), the Banach fixed-point theorem for complete metric spaces (as applied	•	
	compact spaces (as applied in measure theory), the Riesz representation theorem for linear forms in a Hilbert space (as appl		•
	s in Rn (as applied in linear algebra the Perron theorem), the elements of category theory for a practical man, etc. The asset	may be a certain	encouragement
in a students research.			_
XP01KAS	Complexity and Combinatorical Algorithms	ZK	4
XP36KP	exity of algorithms. P and NP problems and their solutions: exact solutions, heuristics, approximation schemes, probabilistic algorithms. Protocols	ZK	4
	Communication Protocols of principles, SDL language, protocol architecture: ISO OSI, error control, data-link layer protocols: X.25, higher layer protocols	1	-
•	nentation tools (FSM language ESTELLE, regular grammars), use of Petri nets, specification language LOTOS, protocol trans		_
validation and verification	on of protocols.		
XP35CCM1	Cooperative control of multi-agent systems	ZK	4
-	control is a relatively novel and rapidly developing area of control theory and engineering. Instead of centralized, large systems with large large transfer and appropriate a		
· · · · · · · · · · · · · · · · · · ·	ns, with local computation and communication capabilities. The broad aim is solving classical problems e.g. stabilization, tract I and team cooperation robust to changes in communication topology and disturbance. Relevant topics of classical control the	_	-
	atics needed for the course is also provided. The potential use of multi-agent cooperation in challenging applications involving	=	
observed is discussed.	Theory: Review of qualitative properties of dynamical systems, Motivation for distributed multi-agent systems, Elements of al	gebraic graph the	ory, Distributed
	Consensus and synchronization of linear/nonlinear, continuous/discrete-time systems, Cooperative stability, optimality and rol	bustness, Distribu	ted optimization:
	ry, Interactions with environment.	717	4
XP34CNO	Integrated Optics ogical principles of IO Basic materials for IO. Light propagation in waveguide structures. Methods of waveguide structure desig	ZK	4
	ictures. Modal spectroscopy. Fundamental physical effects and interactions for IO. Preparation of dielectric waveguides and s	-	
	al modulators. Applicable measurement methods. Devices based on nonlinear effects. Semiconductor integrated opto-electrons		3
XP16ECM1	Quantitative research methods in economy 1	ZK	4
	sequel to Statistics/Linear regression. The objective of the course is to expose the student to variety of common and practical		-
	a stronger appreciation of strengths and weaknesses of econometric methodology and to overview historical developments in		
-	nthe general linear model and knowledge how to deal with basic model and data deficiencies, simultaneous systems, and sir Sing theoretical topics covered in the essential courses on Econometrics. The course will follow with different empirical research		
-	oduced by the relevant economic theory-model. Using own and empirical data sets, the students will apply standard econom		
	ercise sessions will provide introduction into advance use of statistical packages (best is TSP or Stata or their derivatives like		
possible solutions of pro-	oblem sets. The course will require intensive work with data and statistical packages.		
XP16ECM2	Quantitative research methods in economy 2	ZK	4
	a sequel to the basic Econometrics (Basic statistical methods and Linear regression model). It assumes familiarity with the ge		_
	nodel and data deficiencies, simultaneous systems, and simple time-series processes. Advanced Econometrics is the next co ression) designed to introduce tools necessary to understand and implement empirical studies in (micro)economics. The main		
_	models in the context of cross section and panel data analysis, (ii) to focus on situations where linear regression models are	· ·	
	e objective of the course is to expose the student to variety of basic applied microeconomic challenges with the ultimate goal		=
· ·	esses of the econometric methodology. Examples from applied work will be used to illustrate the discussed methods. Selected to	opics from advanc	ed econometrics
will be covered as well.	lo ere p	717	4
XP16KVM	Quantitative Research Methods in Management SPSS for advanced statistical methods as multiple regression and correlation, analysis of variance, factor analysis, cluster a	ZK	4
research and managem		naiysis and its usi	ng in marketing
XP01KVP	Quantum Computing	ZK	4
-	presents a new programming paradigm. The safety of nowadays encypering techniques is based on enormous computation co	1	cal mathematical
•	ay be broken by quantum computers. The ``building stones" of a quantum computer and quantum computers will be develop	ed during the cou	rse. We will
	algorithms, fast database search, etc.		
XP17LAE	Medical Applications of Electromagnetic Field	ZK	4
•	M Field medical applications. Principals and technical equipment for EM thermotherapy, hyperthermia applicators. Calculatio nicrowave thermotherapy apparatus are given, especially from the point of view of applicators for local, intracavitary and regic		-
	rasound and radiometry) and special compatible applicators are described.	mai treatment. No	ii iivasive
XP37LN	Aircraft Navigation	ZK	4
XP35LMI	Linear Matrix Inequalities	ZK	4
	ing or optimization over linear matrix inequalities (LMIs) is an extension of linear programming to the cone of positive semide		II methods are
· · · · · · · · · · · · · · · · · · ·	ol in systems control and signal processing. Theory: Convex sets represented via LMIs; LMI relaxations for solution of non-co		-
	algorithms to solve LMI problems; Solvers and software; LMIs for polynomial mehods in control. Control applications: robustne	ss analysis of line	ar and nonlinear
· · · · · · · · · · · · · · · · · · ·	d-order robust controllers with H-infinity specifications. For more information, see http://www.laas.fr/~henrion/courses/lmi	71/	4
XP35LMI1	Linear matrix inequalities ingo or climber in the cone is an extension of linear programming to the cone of positive semide	ZK	4 Il methods are
	ol in systems control and signal processing. Theory: Convex sets represented via LMIs; LMI relaxations for solution of non-co		
problems; Interior-point	algorithms to solve LMI problems; Solvers and software; LMIs for polynomial mehods in control. Control applications: robustne	ss analysis of line	ar and nonlinear
-	d-order robust controllers with H-infinity specifications. For more information, see http://www.laas.fr/~henrion/courses/lmi Výsl	edek studentské a	ankety p edm tu
<u> </u>	ut.cz/anketa/aktualni/courses/XP35LMI	717	4
XP35LSD	Linear Systems the master program lectures on Dynamical Systems Theory. The structure and properties of linear multi-input multi-output sys	ZK	4
•	design of linear controls is demonstrated. The presentation focuses on pole placement techniques, linear state regulation and		-
	transfer-function design techniques are compared. The lectures are supported by laboratory experiments using Matlab, Contro		
Toolbox.			
XP36LSM	Logical Simulation	ZK	4
	simulation: fundamental ideas and principles of simulation systems, synchronous and asynchronous simulation. Simulation systems, experience architectures, sequential environment (processes, functions, procedures), signals and their attributes, resolution		
-	pes, entities, architectures, sequential environment (processes, functions, procedures), signals and their attributes, resolutio blocks, structural description), configuration of structural models. Students who completed course 36SIM cannot enroll.	ni iunolion, paralle	a environment
, III III III III III III III III	, service from the service of the se		

XP33LPD	Logic and Logic Programming	ZK	4
	nd its relation to technical disciplines. Formal system and its essential properties - validity, completeness. Syntax and semanti		
	inguage and its interpretation. Theory and its model, Herbrand´s model. Herbrand´s theorem, Gödel´s completeness theorem I and probability. Logic programming and Prolog language. Metodology of logic programming. Introduction of extralogical feature	•	•
	ramming (CLP)and inductive logic programming (ILP). Some practical examples of complex logic programs and practical appli		ates. New trends
XP38MPX	Magnetism in Engineering Practice	ZK	4
	luced into the magnetic materials, magnetic sensors and engineering magnetism including FEM design and magnetic measur	1	g. The content of
this advanced course	can be modified according to the students' needs.		
XP02MHD	Magnetohydrodynamics	ZK	4
Qualitative description	of the behaviour of hot plasma in magnetic fields		
XP16MAN	Management	ZK	4
	ment and its innovation, modern ways of management, responsibility of managers, manager's ethics, successful manager thin		
XP16MAV	Production Management	ZK	4
	process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning w production management, standardization. Controlling, production management methods.	ith respect to pro	duction typology.
XP33MZT	Management of Knowledge and Information Technologies	ZK	4
	to the design of knowledge-based and information reclimbolities. Configuration of information systems. User interfaces, especially co		1 .
	s of the problem solving processes based on description of the workflows. Simplification of the processes by the support of IT (Pr	-	_
Engineering). Models	and tools for modelling. IT applications in enterpreneurship as well as in the project management. Business Intelligence. Value	e chains: links am	ong suppliers,
manufacturers and cu	stomers. E-commerce. Role of knowledge in globalization of businesses. Virtual enterprises and organizations.		
XP16MAU	Accounting for management	ZK	4
	agerial accounting. Relations to the organisational structure of the enterprise and to the production process. Budgets, use for many control of the production process.	nanagement. Calc	ulations and cost
-	and measurement of productivity in the production process. The managerial information systems.		T .
XP16MAR	Marketing	ZK	4
	s of the marketing management. Marketing research and marketing information system. Concepts of marketing strategy. The us olicy, pricing and contractation policy, communication, distribution. Marketing mix.	e of product life cy	cle and portfolio.
		7V	4
XP16MAS	Marketing Strategies nowledge of marketing. The analysis of marketing strategies in different market situations. The firm`s behavior under competit	ZK	1
_	eld of product policy, price and condition policy, communication policy and distribution policy.	ion and competitiv	ve auvantage.
XP33MAD	Mathematical Analysis of Dempster-Shafer Theory	ZK	2
	ry (DST) presents a model for uncertainty quantification and processing in knowledge-based systems. The belief function, which	I	1
of uncertainty introduc	sed and investigated in this theory, can be taken as a generalization of probability measure. The model of DST will be presented	d. Generalizations	to infinite spaces
	as well as to the case when only a fragment of the outcoming knowledge demanded by the classical DST is at our disposal. Both		-
	values will be also briefly mentioned. The intended goal of the course is to offer a solid basis for the practical and critical appli	cations of DST in	various fields of
	ward decision making under uncertainty.	71/	
XP01MST	Mathematical Statistics dered sampling and their distributions. Sample statistics. Point estimates and interval estimates.Confidence intervals. Estimati-	ZK	4
	testing for distribution parameters. Hypothesis testing for equality of parameters. Nonparametric tests. Regression analysis.	ons, unbiased and	2 CONSISTENT
XP01MTS	Mathematical Methods in Signal Theory	ZK	4
_	periodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and		1 -
Analytic signals.			
XP01MKR	Mathematics for cryptography	ZK	4
Introduction to the the	ory of groups, finite fields, and polynomials over finite fields and their applications in cryptography.		
XP33MKD	Mathematics for Cybernetics - Selected Topics	ZK	4
	nathematics. Ordering, lattices, Boolean algebras, representations. Topological spaces. Metric spaces, completeness, fixed-po		• •
	, constructions with linear spaces. Systems of linear equations, spectral theory. Matrix calculus, matrix inequalities. Least squares	s and singular valu	e decomposition.
XP34MTP	entary theory of Hilbert spaces. Introduction to category theory. Motorials and Technologies for Photonic Devices and Structures.	ZK	3
_	Materials and Technologies for Photonic Devices and Structures lainted with optical materials such as semiconductors, optical glass, crystals, and polymers. The students get acquainted also v	1	_
	ctronic devices and structures. It will be present technologies for deposition of the micro and nano layers deposition. Students	_	
	Il be shown principles of integrated optoelectronic devices and structures. It will be also shown the design of the photonic structures.		
the measurement of the	ne optical and optoelectronic properties.		
XP01MTP	Matrix Calculus	ZK	4
	an blocks, Jordan canonical matrices. Real canonical form of a real matrix. Characteristic and minimal polynomial. Caley-Hamilt		
	metric, orthogonal and positive matrices. Diagonalization of symetric, positive and circulant matrices. Singular value decomposit	ion. Moore-Penros	se pseudoinverse
	olution of systems of linear equations.		
XP15MPE	Mechatronics in Electrical Power Engineering	Z,ZK	4
	models and control systems of steam generators, steam and water turbines and nuclear reactor. Dynamics and control of STATCO		
XP38MMN	Measurement of Nonelectric Quantities sensors. Measurement of temperature, pressure, flow, movement, position and other physical quantities. Chemical sensors ar	ZK	ensors metal
	sensors, measurement of temperature, pressure, now, movement, position and other physical quantities. Chemical sensors ar f explosives. New types of signal conditioning circuits. Sensor Applications in industry, transport and consumer electronics. Se	=	
	chnology. Signal processing in sensor systems, intelligent sensors.	ourky and military	applications.
XP15MVN	High Voltage Measurement	Z,ZK	4
_	ges and high voltage generators. Measurement cables, attenuators. Disturbances of HV measurement. Measurement of impulsions and high voltage generators.	1 '	1
types of dividers. Dividence	ders for measurement of fast transients, calibration of dividers. Measurement of DC high voltages, HV resistors and dividers. Measurement of DC high voltages, HV resistors and dividers.	Measurement of A	C high voltages,
	urement of RMS voltages. Instruments for measurement of voltage peak values. Measurement of high current, shunt reactors,	Rogowski coil. Me	easurement of
	vutilization of optical-fibre waveguides. Voltage tests of transformers. HV measurement of dielectrics.		1
XP37MVP	Scientific Work Methodology	ZK	4
	ion of scientific work, exploitation of literature and other information resources, accessible databases, fundamentals of project		-
	ements (PhD Thesis, article, conference), patents and patent search, Internet exploitation, discussion groups, WWW present		esentation.
XP17MVP	Methodology of Science	ZK	
XP33MMD	Analysis and visualization methods for medical data	Z,ZK	4

XP17MAPP	Analysis Methods for Passive Elements of Microwave and Millimeter-wave Technique	ZK	4
	ssion lines parameters. Computation of microwave circuits scattering parameters, analysis of planar antennas. Survey of bas		
	on methods: spectral domain, integration equation, finite differences, finite elements, mode matching, transversal resonance.	Survey of basic th	eorems of
	moment method, disturbance method.	71/	4
XP38MDR	Methods of Signals Digitalization and Reconstruction onventional methods of analog preprocessing of typical sensors signals, selection of optimal digitization methods and optimiza	ZK	4
· ·	rement results to achieve high accuracy and effective suppression of disturbing signals.	lion of hardware si	bidilori iriciddirig
XP38MPM	Methods for Precision Measurement of Electrical Quantities and Measurement Data Processing	ZK	4
	electrical quantities. Collective standards. Inductive ratio devices for precision electrical measurements and possibilities of improvements		
	ecision measurement of active and passive electrical quantities. Evaluation of measurement errors and uncertainties. Metrolo		
of measurement data.			
XP38MET	Metrology	ZK	3
	on solving problems connected with the metrology of electrical quantities and application of modern tools to it. The lectures account of the control of the	quaint students wit	h the up-to-date
	asurement of electrical quantities with an accent to correct evaluation of accuracy.	71/	4
XP14MID	Microprocessor Control of Electric Drives r architecture. ADC, DAC special circuits, DMA, measurement of pulse parameters. Event memories, FIFOs, CAMs, multiport	ZK AND goto orro	4 va Sarial
•	ocessor concept, fast computing, interface issues. Parallel information processing. Multiprocessor systems. Real-time system		
-	te driven systems, F/B systems. Interrupt driven system, full featured kernels. Tasks, intertask communication, queues, sema	_	
and issues. SW, HW de	sign examples.		
XP14MIP	Microprocessor Control of Electric Drives	ZK	4
	s to introduce students to the latest issues of mikroprocessor application in control and regulation of electric drives. The cours	•	
	processor (DSP) architecture, computational resources, fixed point, fraction, floating point arithmetic, interrupt system, DMA		
•	AM, Multiport RAM, impulse signal generation, serial communication, methods, buses, protocols, synchronization, multiproce e RTOS, tasks, queues, semaphors, critical section, control computer programming methods, control computer resources appl		
of electric drives.		iodilon in obdidi di	id voolor control
XP14MIR	Microprocessor Control of Electric Drives	ZK	3
Control computer, digital	al signal processor (DSP), digital signal microcontroller (DSC), architecture, computational resources, fixed point, fraction, floa	ating point arithme	etic, interrupt
•	, special blocks, ADC, event memory, FIFO, CAM, Multiport RAM, impulse signal generation, serial communication, methods, I		
•	s, parallel processing, RT systems, solution methods, systems: INT, BG-FG, FSA, CC, preemptive RTOS, tasks, queues, sem	aphors, critical se	ction, control
	methods, control computer resources application in scalar and vector control of electric drives.	71/	4
XP34MSY	Microsystems and classification of microsystems. Micro-sensors. Micro-actuators. Signal processing within the system. MEMS (micro-electric	ZK	4
•	structures). MEMOS (micro-electrical-mechanical-optical structures). Microsystem design. Microsystem modelling. Manufact		<i>'</i>
Industrial applications.		3	
XP34MSA	Microsystems and Microactuators	ZK	3
	system integration applied in the design of digital and analog systems with application of system engineering, in i tis solved in		
-	ems on a chip as well as external. The course shows new possibilities of realization and application of integrated micro-compon	_	
	s using mainly MEMS technology, increasing reliability with all its attributes. The course introduces modern elements - microa basic applications in industry, medicine, regulation, automotive control, etc. Basic elements of nanotechnology and nanoelec		
	ds students' expertise with the latest multidisciplinary chip elements and their wide use in information technologies, IoT, biom		
industry etc.		•	
XP17MT	Microwave Technique	ZK	4
	n lines and its circuit elements including hybrid and monolithic integrated circuits technology. Resonators and other type of pa		
•	solators and circulators, modulators etc.) and active microwave circuits (e.g. oscillators, mixers and amplifiers), microwave filte	ers, microwave me	easurement.
CAD of microwave circu		71/	4
XP32MOS The course familiarizes	Mobile Networks students with evolution and standardization of mobile networks and mainly provides a detailed description of network architectu	ZK res and discusses	hasic principles
	s. The course as well depicts trends and the future development of mobile networks.	ires and discusses	basic principles
XP33MOL	Modal Logics for Distributed Systems	ZK	4
	n distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possib		Properties of
	lence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agree	ment.	
XP13MSD	Modelling and Simulation of Technological Systems	Z,ZK	. 4
	tter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap		
	of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Exa mechanical systems, hydraulic systems and thermal systems. Examples of simulations.	mples of simulatio	ins. Modelling of
XP33ICT	Modern ICT for Industry and Smart Grids	ZK	4
XP02MPF	Modern 101 for middelty and official official	Z,ZK	2
XP14RPD	Advanced Controlled Drives	ZK	3
	frequency feeding. Current source converter. Voltage source converter, PWM, Electromagnetic torque by feeding from freque		-
	and indirect torque control system, Self-controlled synchronous motor drive. Methods for rotor position determination. Switch F	=	
XP14MPO	Advanced Controlled Drives	ZK	4
XP14MRP	Advanced Controlled Drives	ZK	3
XP37MSC	CNS Modern Systems	ZK	4
XP34APD	Advanced Power Semiconductor Devices and ICs	ZK	4
-	ical structures. Development trends. Parameters and applications. Bipolar structures. MOS structures. BiMOS structures. PN	· · · · · · · · · · · · · · · · · · ·	
	BT transistors. Thyristors (including GTO and MCT). Secondary breakdown, mechanism, safe area. Smart-power devices. High	voltage ICs, opera	ation, principles,
Applications XP14MZR	New Control Methods for Electric Drives	ZK	4
	New Control Metriods for Electric Drives - to introduce students to the latest issues of control and regulation of electric drives, taking into account the focus of their docto		-
The aim of the course is			
	gy conversion parameters in electric drive systems and relevant power electronics, in particular by using modern control and	regulation algorith	nms. The course
electromechanical ener		regulation algorith	nms. The course

XP14MPD Advanced Control Methods of Electric Drives Development trends in electric drive control. Application of microprocessor technology, program realization of algorithms for modern drives, modulators, realization of direct and indirect induction machine torque control, converter with harmonic current control for synchronous machine, functions and control of compatible rectifier, preview of modern controllers for electric drives. XP37MPS Multimedia Signals Transmission Generalized communication system scheme. Extended knowledges in radio transmitters and radio receivers. Radio transmitters and receivers system design. Satellite communication systems. Public cellular radiotelephone systems. Terrestrial and satellite digital broadcasting. Analog and digital radiorelay systems. Metallic communication systems. Noncoherent and coherent optoelectronic communication systems. Modulation and multiplexing in optoelectronic systems. Cable television networks, interactive television systems. Mobile radiocomunications development trends. Electromagnetic compatibility. XP37NAV Navigation systems 7K The course is focused on the field of navigation systems and their practical applications. It covers GNSS technology including definition of coordinate systems, explanation of the physical problems associated with satellite navigation, and positioning methods. On the other hand, only one lecture is devoted to the design of GNSS receivers, since the issue of radio receivers is in details described in other master's course Architecture of Radio Receivers and Transmitters. The GNSS area is further extended to the field of inertial navigation including the navigation equations and mechanization of the calculation, inertial sensors and aiding systems/sensors, e.g. pressure based altimeters, magnetometer, Lidars, ultrasonic transducers, radars, etc. The focus is paid on detailed data fusion practical tasks for estimating position, velocity and attitude in outdoor/indoor environment. XP31NOS Design and circuit structures of electronic systems ZK The course deals with important applications of analogue technique. The subject is divided into the three basic parts. The first part is devoted to amplifiers and analog functional blocks for measurement and signal processing. Special application amplifiers, nonlinear and parametric analog functional blocks and fast analog circuits operating in current mode are also discussed. The second part is devoted to linear analog systems, their characteristics, description and synthesis capabilities. There are discussed: the types of filters and their field of application, methods of filter synthesis and their optimization with regard to real properties and value variances of the circuit elements, implementation of active filters, including discrete-time filters, i.e. switched capacitor (SC) and switched-current (SI) circuits. The last part deals with computer-aided circuit design. The principles of modeling of the analyzed system, including models of functional blocks and circuit elements are discussed together with simulation result processing and their utilization for circuit design and optimization. XP31DIF Digital filter synthesis ZK LTI systems and digital signals. Impulse response, step response, convolution. Elements of z-transform and Fourier transform. Difference equation, transfer function, magnitude, phase and group delay. Design methods for finite impulse response (FIR) digital filters - windowing and frequency sampling methods, optimal design algorithms. Analytic design of FIR filters, half-band and narrow-band filters. Design methods for infinite impulse response (IIR) digital filters. Bilinear transformation. Analytic design methods in digital z-domain. All-pass sections as building blocks for signal processing. Group delay equalization, phase shift and notch filters. Wave digital filters. XP34PIC Programmable IC Design ZK The aim of the course is to acquaint students with advanced methods of design, synthesis and verification of programmable systems and systems with high integration on the chip. Students will learn the basic building elements, architecture and design procedures used to implement complex integrated systems, methods of describing them, and procedures their synthesis. They will learn verification strategy, design and analysis of tests. This project-oriented course would with the use of state-of-the-art EDA tools to implement a comprehensive programmable integrated system whose application would be linked to the topic of the dissertation. CAD for RF and Microwave Circuits Current models of semiconductor devices and transmission lines implemented in the PSpice class and similar programs. Hierarchy of the models of other elements of RF and microwave circuits. Enhancing the model accuracy with artificial neural networks (ANN). Advanced algorithms for analysis and optimization of RF and microwave circuits. Model parameter extraction. XP35NES1 Nonlinear systems ZK The goal of this course is to help student develop a deeper and broader perspective on theory and applications of nonlinear systems. At the hearth of the course will be the so-called differential-geometric approach, which can be used for controllability and observability analysis of nonlinear systems, characterization of various types of exact feedback linearization and many other tasks. Great attention is paid to analysis of the structure of nonlinear systems from the perspective of control design. It follows from the state description of nonlinear systems and uses state transformations of the nonlinear model into a simpler form that is usable for control design. Differential-geometric conditions for existence of these transformations are studied in this course. Concepts of nonlinear controllability and observability are introduced in this course and their relation to stabilization and reconstruction is analyzed because it is not as clear as for linear systems. Some additional topics such nonsmooth stabilization and discontinuous stabilization will be covered. Examples of use of the presented theories in underactuated robotic walking, nonholonomic systems and optimization of biosystems will be given. Nonlinear Systems This course constitutes a continuation of the master level course "Nonlinear systems" being opened during winter semester. It is devoted to the detailed study of nonlinear systems structure from the control design point of view. It is based on state space descripion of nonlinear systems. Model transformations will be studied to simplify them and thereby faciliate the controllers design. It gives mathematical conditions for the existence of these transformations. Nonlinear analougues of controllability and observability will be introduced and studied as well and their relation to detectability and stabilizability investigated. Finally, elements of nonlinear output regulation as well as of nonlinear robust and adaptive design will be presented. Exercises will be, in particular, based on MATLAB and SIMULINK use. NIC XP04N1 German language 1 Extending skills with the emphasis on professional language. Listening to authentic technical texts from areas of electrical engineering, eliciting basic information from the text. Reading and analysis of professional texts regarding the needs of postgraduate students. Training of various reading skills. Writing technical texts on specific topics, CV, job applications, conversation lessons for advanced students based on 5 video tapes about these topics: postgraduate studies, professions, internships abroad, professional and scientific work, the profession of an engineer. Revising and extending typical grammar for technical style, syntax of technical texts. XP04N1ZK German language 1 Extending skills with the emphasis on professional language. Listening to authentic technical texts from areas of electrical engineering, eliciting basic information from the text. Reading and analysis of professional texts regarding the needs of postgraduate students. Training of various reading skills. Writing technical texts on specific topics, CV, job applications, conversation lessons for advanced students based on 5 video tapes about these topics: postgraduate studies, professions, internships abroad, professional and scientific work, the profession of an engineer. Revising and extending typical grammar for technical style, syntax of technical texts. XP04N2ZK German language 2 ZK 0 XP04N2 German language 2 NIC The course is focused on extending and elaborating grammar and conversation, namely on professional language skills (reading + writing technical texts, preparing papers, reviews, presentations etc.) ations etc.) XP36NSN **Neural Networks and Neurocomputers** 7K Theoretical background, paradigm classification and artificial neural networks learning methods. Student is supposed to propose and test the application of an artificial neural network for a partial issue concerning his dissertation theme during the semester. Procedure and results would be concluded in the preliminary publication form designed to be presentable on a scientific forum.

XEP33NEP	Neuroprosthetics cerned with the use of artificial devices to replace or improve the function of the human nervous system. The neuroprosthetic	Z,ZK	idespreaduse
•	rith approximately 150,000 in use worldwide. In this course we will look at the different technologies involved, particularly in te		-
materials and their prac	tical use. We will also see how such implants interact with the human nervous system, forming a bidirectional gateway both to	o monitor signals	on the nervous
	timulate the human brain.As well as witnessing the exciting development of the field we will consider neuroprosthetics in tern s but also for visual and motor repair. We will however also look at the possibilities of Neuroprosthetics for general human enl	•	
	experimentation fits into teh field. Whilst the course will focus on technical issues, it will be presented in a general way such the course will focus on technical issues, it will be presented in a general way such the course will focus on technical issues, it will be presented in a general way such that the course will focus on technical issues, it will be presented in a general way such that the course will focus on technical issues, it will be presented in a general way such that the course will focus on the course will be presented in a general way such that the course will focus on the course will be presented in a general way such that the course will focus on the course will be presented in the course will be course with the course will focus on the course will be presented in the course will be course will be course will be course with the course		-
follow (i.e. a mathematic	cal background is not a requirement). Indeed as this technology has immediate impact, societal, ethical and moral issues rais	ed will also be dis	cussed. The
course is complementar technology.	ry to the lecture course given on Bionics: this set of lectures being specifically concerned with neural aspects - linking the hum	an brain and nerv	ous system with
	New Matherials and their Application	Z,ZK	4
The course is focused of	on the topic of the doctoral thesis, e.g. carbon materials and composites, conducting polymers and composites, biomimetic m		
materials, and new materials			
XP14MEN	New Trends in Converter Technology to introduce students to the principles and functions of latest topologies of power semiconductor electric energy converters, to	ZK	t the scope of
	to fithe subject is the optimization of the power conversion parameters in power semiconductor converter systems. The subjec	-	-
	oles, topologies, functions and possibilities of application of power semiconductor converters realized on the basis of modern p		-
	erful control microcomputers. The topics are focused on pulse width modulation methods for voltage and current control, mod	•	
• •	e control of the current curve and the voltage curve, as well as the overall quality of electric energy transmission. The problen level converters, resonant converters as well as problems related to their practical use are also solved.	ns of analysis and	synthesis of
	New Trends in Converter Technology	ZK	4
	onductor devices. Pulse Width Modulation methods for current and voltage control. Single-phase PWM converter. Converters wi		• •
converter with active cur Resonant converters.	rent shape control. Three-phase converter with active current shape control. Converter with active voltage shape control. Conve	rters for multisyst	em locomotives.
XP14APR	New Trends in Electric Device Apply	ZK	3
XP14NAP	New Trends in Electric Device Apply	ZK	4
XP14APD	New Trends in Electric Device Applications	ZK	4
· ·	nent and design of electric apparatus. Electric apparatus and electric devices co-operation. Electric apparatus switching chara		
	ng overvoltage and possibility of its limitation. Up to date systems for overvoltage limitation. Problems of high voltage motor s up to date methods. Internal smart installations. New generation of building installations.	witching. Electric	apparatus
XP14NTP	New Trends in Electric Device Theory	ZK	4
XP14TPR	New Trends in Electric Device Theory	ZK	3
XP14TPD	New Trends in Electric Device Theory	ZK	4
Switching arc latter mod	dels and theory. Switching arc physics. Interaction between switching breaker and electric circuit. New knowledge in electric a	rc extinguishment	. Influence of
extinguishing medium o limitation. Electric contact	n physical process in arcing chamber. Switcher braking capacity and possibility of their inducement. Fuses theory. Electric cir	cuit braking with	short current
XEP33NUM	Numerical Analysis	Z,ZK	4
	o basic numerical methods of interpolation and approximation of functions, numerical differentiations and integration, solution		=
	equations and systems of linear equations. Emphasis is put on estimation of errors , practical skills with the methods and demo	onstration of their	properties using
Maple and computer gra XP33NUM	apriics. Numerical Analysis	Z,ZK	4
	o basic numerical methods of interpolation and approximation of functions, numerical differentiation and integration, solution		
	tions and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demonst		
Maple and computer gra			
XP01NLA	Numerical Linear Algebra	ZK	4
-	bra. Norms of vectors and matrices. Numerical linear algebra. Special systems. Eigenvalues and eigenvectors. Iterative meth eneralized solutions of linear systems.	ous. Matrix invers	ion. Singulai
XP32NMR	Numerical Methodes of Electromagnetic Tasks Solution	ZK	4
•	nalysis of electromagnetic field distribution through both air and other environment. It offers a view deep inside to popular nume		
	nent Method and Finite Element Method. Handling the software is obvious nowadays; nevertheless, the mayor attention is paid to apparatus and understanding the physical principles of the solved tasks in symbiosis to particular used software.	o understanding th	ne mathematical
	Numerical Methods in Electromagnetic Field	ZK	4
	z and wave equations. Analytical, semianalytical, seminumerical and numerical methods. Matrix equations and algorithms: Mo	1	=
•	od of Moments, Multiple MultiPoles, Boundary Element Method, Finite Difference Method, Finite Element Method, Finite Integr		bility of solution.
	ions: direct methods, Gauss-JordanOs elimination, pivotation, LU-decomposition, banded and sparse matrix, conjugate-grad		4
XP34EHA The course deals with s	Renewable Energy Microsources for Electronics - Energy Harvesting ystem integration applied in the design of digital and analog systems with application of system engineering, in i tis solved in	ZK terconnection of v	4 arious types of
	ms on a chip as well as external. The course shows new possibilities of realization and application of integrated micro-compon		
	s using mainly MEMS technology, increasing reliability with all its attributes. The course introduces modern elements - microa		
_	basic applications in industry, medicine, regulation, automotive control, etc. Basic elements of nanotechnology and nanoelec ds students' expertise with the latest multidisciplinary chip elements and their wide use in information technologies, IoT, biom		
industry etc.	as statethe expense with the latest manufacturing only elements and their wide ase in information technologies, lot, storing	culonic, acrospac	e, automotive
XP37IPP	Image Processing and Photonics	ZK	4
	cipline used in space technology. Students will become acquainted with advanced imaging photonics used in space sciences, in		
•	nd the influence of the environment. In addition, there are included parts describing the parameters of optical instruments (P\$ ation modeling and removal methods for IR - VIS electromagnetic radiation. The subject also includes a description of the ser		
•	he reconstruction of the acquired image, and discusses its use in space applications. In addition, there are parts including Earth	-	1
	nstruments in this area, including optical Fourier transform, electromagnetic wave polarization research, and hyperspectral in	naging and data p	rocessing in this
area, including image da	ata telemetry.		

XP32ODV	Intellectual property protection	ZK	4
	the basic issues of intellectual property (IP) protection. Students learn why it is necessary to protect research results, how the		
•	now to obtain a trademark and also how to succeed with IP protection at the international level. The course also deals with lic		
	thods as part of a standard way of commercializing original IP. Emphasis is put on quality methodology for database searchi ent projects. Motto: Those who do not protect the results of their research work can never dream of being on par with the bes	-	r successiui
XP35OFD	Estimation and Filtering	ZK	4
	nt design, structure selection and parameter estimation. Bayesian approach to uncertainty description. Posterior probability de	1 1	•
	Robust numerical implementation of least squares estimation for Gaussian distribution. Parameter estimation and state filter	-	
	perties of Kalman filter. Kalman filter for colored/correlated noise.		
XP35ESF1	Estimation and filtering	ZK	4
Methodology: experime	nt design, structure selection and parameter estimation. Bayesian approach to uncertainty description. Posterior probability de	ensity function and	point estimates:
	Robust numerical implementation of least squares estimation for Gaussian distribution. Parameter estimation and state filter	ring - Bayesian ap _l	proach. Kalman
	perties of Kalman filter. Kalman filter for colored/correlated noise.		
XP33OSD	Real Time Operating Systems	ZK	4
	perating systems, system and user modes, memory protection, operating systems (OS) classification and types, special requ pocesses and application programs, kernel and its services, system calls. Concurrent processes and threads, inter-process commu		
	es. Process scheduling, scheduling in single- and multiprocessor systems. Processor management, process creation and termina	• •	
	ystem functions, disk allocation strategies, device drivers. Inter-process communication (IPC), IPC based on shared memory		-
-	tion, critical section, deadlocks. Synchronization tools: semaphores, monitors, looks, deadlock detection and prevention. OS kern		
TCP/IP.			
XP37ODS	Optical Design and Simulation	ZK	4
XP17OV	Optical Fibers	ZK	4
	ibers, attenuation and dispersion, step-index fibers, gradient fibers, single and f1ibers, optical cables, splices and connectors	s, optical fibers me	asurements,
·	nenomena in optical, fibers, fibers for sensors.		
XP32OSY	Optical Systems	ZK	4
	stems are being more extensively used in a practice, particularly in a telecommunication networks. Tremendous transmission		
function.	ey factors making it attractive. The objective of this subject is to provide students with a more rigorous theoretical background	of fiber and transf	nission systems
XP35ORC1	Optimal and robust control	ZK	4
	urse about modern control design methods that formulate the design as a mathematical optimization. Besides teaching pract	1 1	•
	er understanding of fundamental concepts as well as build awareness of the latest results. Thanks to its background in mathe	-	
	nly be seen beyond the borders of automatic control domain. The course can be viewed as an extension of the equal-named	· ·	
(B3M35ORR). However	, numerous topics are new and those few topics that already appeared in the master version will be discussed at a significan	tly deeper level. Th	his time the
	give practical tool but also to go through the proofs, discuss various interpretations, and survey the results from the latest literat		
-	s to acquire advanced competences (knowledge and skills) in the area of computational design of control systems (or rather	_	
	ssume availability of a mathematical model of the system to be controlled (hence model-based control design). We will conside		
as well as discrete time			
	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to	the design task as	an optimization,
the crucial competence		the design task as	an optimization,
the crucial competence	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to will come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games).	the design task as	an optimization,
the crucial competence of variations, operator the XP36PSV	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to will come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming)	the design task as and infinite-dimen	an optimization, nsional (calculus
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communic	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms and scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnectation algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations	the design task as and infinite-dimer ZK stion networks, emis. Fundamental par	an optimization, nsional (calculus 4 beddings, rallel algorithms
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communication - reduction, prefix competence of variations and variations.	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms Indicate the systems and Algorithms of scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnectation algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations utation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexity	the design task as and infinite-dimer ZK stion networks, emis. Fundamental par	an optimization, nsional (calculus 4 beddings, rallel algorithms
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communic - reduction, prefix comp studies in specialization	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms Indicate the semidestance of the semidestance o	the design task as and infinite-dimer ZK stion networks, emis. Fundamental party theory Graduate	an optimization, nsional (calculus 4 beddings, rallel algorithms as of engineering
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communic - reduction, prefix comp studies in specialization XP01PDR	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms Indicate the systems and Algorithms and scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnectation algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations utation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexit Computer Science and Informatics FEE CTU cannot register. Partial Differential Equations	the design task as and infinite-dimension and infinite-dimension and infinite-dimension and infinite-dimension are supported by the action of the control of	an optimization, nsional (calculus 4 beddings, rallel algorithms as of engineering
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communic reduction, prefix competitudies in specialization XP01PDR Problems in partial difference of variations.	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms and scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnectation algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations utation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexit Computer Science and Informatics FEE CTU cannot register. Partial Differential Equations rential equations of mathematical physics. Initial and boundary value problems. The method of characteristic functions, integr	the design task as and infinite-dimension and infinite-dimension at the street of the	an optimization, asional (calculus 4 beddings, rallel algorithms as of engineering 4 rical methods.
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communic - reduction, prefix competudies in specialization XP01PDR Problems in partial differ XP34PED	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms Indicate a semidefinite programming of the seminary of the semin	the design task as and infinite-dimension and infinite-dimension at the street of the	an optimization, nsional (calculus 4 beddings, rallel algorithms is of engineering 4 rical methods.
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communic - reduction, prefix competudies in specialization XP01PDR Problems in partial differ XP34PED Energy band engineering	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms Indicate a scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnectation algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations utation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexit Computer Science and Informatics FEE CTU cannot register. Partial Differential Equations Tential equations of mathematical physics. Initial and boundary value problems. The method of characteristic functions, integral Advanced Electronic Devices g. Quantum well, wire, point. 2D electron gas based devices (HEMT, MOD FET). Devices based on resonance double-barrier to the problems in the p	the design task as and infinite-dimension and infinite-dimension at the street of the	an optimization, asional (calculus 4 beddings, rallel algorithms is of engineering 4 trical methods. 4 ctures. Quantum
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communicated reduction, prefix competitudies in specialization XP01PDR Problems in partial differ XP34PED Energy band engineering device applications (measurements)	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms Indicate a semidefinite programming of the seminary of the semin	the design task as and infinite-dimension and infinite-dimension at the street of the	an optimization, asional (calculus 4 beddings, rallel algorithms is of engineering 4 trical methods. 4 ctures. Quantum
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communicated reduction, prefix competitudies in specialization XP01PDR Problems in partial differ XP34PED Energy band engineering device applications (measurements)	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms Indicate a semidefinite programming and scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnectation algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations utation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexit Computer Science and Informatics FEE CTU cannot register. Partial Differential Equations rential equations of mathematical physics. Initial and boundary value problems. The method of characteristic functions, integral Advanced Electronic Devices g. Quantum well, wire, point. 2D electron gas based devices (HEMT, MOD FET). Devices based on resonance double-barrier to mories, generators, multipliers). Heterogeneous structures. Microwave devices, HBT, Gunn diodes. Microwave device applications.	the design task as and infinite-dimension and infinite-dimension at a second se	an optimization, asional (calculus 4 beddings, rallel algorithms is of engineering 4 trical methods. 4 ctures. Quantum
the crucial competence of variations, operator to XP36PSV Complexity measures a simulations. Communic reduction, prefix competudies in specialization XP01PDR Problems in partial differ XP34PED Energy band engineering device applications (mewith internal optical cout XP13PED	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate to swill come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) neory, differential games). Parallel Systems and Algorithms Indicate a scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnectation algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations utation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexit Computer Science and Informatics FEE CTU cannot register. Partial Differential Equations Tential equations of mathematical physics. Initial and boundary value problems. The method of characteristic functions, integral Advanced Electronic Devices g. Quantum well, wire, point. 2D electron gas based devices (HEMT, MOD FET). Devices based on resonance double-barrier to mories, generators, multipliers). Heterogeneous structures. Microwave devices, HBT, Gunn diodes. Microwave device applications.	the design task as and infinite-dimension and infinite-dimension and infinite-dimension at the control of the c	an optimization, asional (calculus 4 beddings, rallel algorithms is of engineering 4 trical methods. 4 ctures. Quantum cous devices
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Advanced methods for circuit analysis and optimization using computer-aided design The first part of the subject deals with contemporary models of both classical semiconductor elements (in submicron domain) and special microwave transistors as HBT, pHEMT etc. Moreover, models of power MOS (LDMOS) transistors are also defined and characterizing the elements by X-parameters is included as well. The modeling part of the subject is completed by characterization nano-scale elements, including noise models, and by a description of memristors, memcapacitors and meminductors. The second part of the subject contains algorithms for solving nonlinear stiff systems of differential-algebraic equations in implicit form combined with nonstandard sensitivity analysis in time domain. The sensitivity analysis in the frequency domain is also included as well as nonstandard sensitivity analysis of noise figure. Attention is also given to steady-state algorithms, in particular, their more difficult form usable for autonomous circuits. The analytic methods are naturally complemented by single- and multi-objective optimizations. Up to four-dimensional optimizations are demonstrated on very complicated, but technically useful tasks from the microwave area including power RF amplifiers. XP16AFM Advanced Financial Management Methods ZK 4 The aim of the course is a deeper understanding of the more complex financial management issues. It builds on knowledge of standard financial management courses. The main topics are alternative capital market models, other investment valuation methods (generalized NPV method, general IRR method). The student will learn how to protect against risk using derivatives, evaluating exotic derivatives. In addition, students will assess using the Monte Carlo method the value of derivatives and financial instruments for which the so-called closed formulas are not available. Other modern finance issues will be addressed through case studies. An integral part is the question of numerical methods, their reliability and their practical use. Students create their own models and simulations based on the chosen topic. The output will be a comparative analysis of the proposed methods and standard methods. The wide use of computational tools and models (Matlab, Mathematica, others) is assumed. Advanced methods of UI design The goal of the course is to introduce advanced methods for user interface and interaction design in non-standard environments, such as virtual and augmented reality. Students will gain theoretical background related to human interaction in such environments. During the course students will get familiar with a set of techniques for design and testing of interactive systems in non-standard environments, especially in virtual and augmented reality with collaborative aspects. Advanced Visualization Methods Human factors in visualization (Perception and cognition, Visual saliency, Visual thinking) Design of User Interfaces for Visualization applications (Evaluation of visualization techniques) Advanced volume visualization (Illustrative volume rendering) Big data visualization, Visual analytics, Animation for visualization, Data compression and reduction Large scale data visualization Visualization techniques in nonstandard environment XP39PMV ZK 4 Advanced Methods of Visualization Scientific visualization based on physical models. Scientific visualization and volume rendering. Volume graphics. Information visualization. Interaction in scientific visualization environment. Scientific visualization in WWW environment. Particle models and visualization of technological processes. Computational fluid dynamics. Advanced Parallel Algorithms Design and analysis of time-, and cost-efficient PRAM algorithms and parallel algorithms for distributed memory machines. The collection of algorithms includes: advanced parallel scan algorithms, distributed list ranking, Cole's MergeSort, optimal mesh sort, connected components, tree contraction and tree evaluation, pattern matching in texts. XP37NOS Advanced Computational Tools for Imaging and Radio Systems 7K 4 The course focuses on advanced image and signal processing with a focus on imaging and radio systems. The emphasis is on the implementation of algorithms as well as on individual work in the laboratory. Students will verify the principles of algorithms in solving non-trivial problems, such as processing of image data from wide-field systems used in astronomy, fast processing of large data volume from non-linear image system, 2D photometric system calibration, and real-time GNSS signal processing. XP37MSP Advanced Multimedia Signal Processing Z,ZK The course covers selected areas of advanced multimedia signal processing with emphasis on processing techniques adapted for sensing, processing and reproduction especially of image and video signals concerning the requirements of human observers and the characteristics of human visual system (HVS). Main focus of the course is on visual information coding, including overview of conventional methods in respect to the information theory, rate-distortion analysis and advanced methods for efficient visual information representation in respect to Quality of Experience (QoE) in emerging immersive multimedia. Emphasis is placed on the rigorous theoretical description of the methods but also on the possibility of their experimental verification in the laboratory using special equipment or simulation tools. Advanced Electromagnetism The course presents advanced topics of classical electromagnetic field theory, especially: electric and magnetic vector potential; reciprocity, duality, and equivalence principle; Green's function; multipole expansion; scattering and characteristic modes; homogenization and Bloch's theorem; synthesis and topological optimization The knowledge gained in this course can be used in many branches of applied electromagnetism, especially in antenna theory and microwave circuit design. XP34SDS Semiconductor Structures The aim of this course is to provide postgraduate students with a deeper and more detailed insight into principles of and properties of advanced electronic and optoelectronic structures. Completion of this course enables doctoral students to deepen the basic knowledge, which they obtained in the bachelor and master stages of study in the field of semiconductor structures and elements. They will be able to solve scientific tasks in electronics and optoelectronics focused on design, analysis and applications advanced electronic and optoelectronic structures. The student will gain deep knowledge of physics principles of PiN and MOS structures, as these dominate the current integrated and power semiconductor technology. The lecture will be further focused on the use of new principles associated with miniaturization and the use of advanced materials. Higher-order phenomena whose knowledge is essential for understanding the current semiconductor devices will be described. It is expected that the course will focus on specific issues according to the interests and scientific focus of the participants. XP34SRS Semiconductor Radiation Sources ZK Stimulated emission in semiconductors. Homogeneous and heterogeneous junction, double heterostructure lasers and LEDs. Non-coherent LED's, super-luminescence diodes. Electromagnetic fields in semiconductor lasers. Types of lasers and their properties. Waveguide lasers, DFB and BFR structures. SQW and MQW lasers, quantum wells. Tunable injection lasers. Spectral line width and line stability. Radiating characteristic, coupling of the radiation source to a waveguide. Bi-stable and memory elements and switches. Semiconductor injection, waveguide amplifiers and wave convertors. Lasers and non-coherent diodes for optical communications. Measurement methods, applications **Practical Data Mining Problems** The course is focused on solving of practical data mining problems. Lectures deal with data transformation, pre-processing and verification, selection of a suitable data mining algorithm and data mining process evaluation and results interpretation. The attention is paid to solving of an individual data mining problem based on real-life data under supervision of the lecturer. XP33PAD Probabilistic Algorithms A survey of basic notions of statistic and probability. An analysis of the notion of non-deterministic algorithm. Effectivity criteria for non-deterministic algorithms. Theoretical apparatus of probabilistic algorithms. The probability of failure. Loss function. The expected risk. Probabilistic analysis of deterministic algorithms. Criteria for application of probabilistic algorithms. Probabilistic algorithms and their practical importance. Probabilistic Models of Uncertainty in Al XP33PMD Basic (discrete) probability. Foundations of graph theory. Triangulated graphs and their characteristics. Information as a measure of dependence. Conditional independence (Factorization Lemma, Block Independence Lemma). Knowledge representation by multidimensional distributions. Qualitative knowledge represented by dependence structures. Graphical Markov models and Bayesain networks. Decomposable models for computation in Graphical Markov models. Examples of application. XP34ADM Principles and Applications of Device Models ZK 4 Fundamentals of the computer-aided technological design. Device simulators Silvaco Atlas and Synopsys Quantum ATK: principles, applications. Basic equations. Boundary conditions. Numerical methods. Recombination models. Avalanche ionisation models. Mobility models. Practical exercises (individual projects) according to the tasks of students' individual theses.

XP37PKP	Biomedical Engineering in Clinical Practice	ZK	4
	tical problems that a biomedical engineer has to overcome in the clinical practice. Position of BME in research and in the clin	-	
	s - design, conducting and evaluation, statistical analysis used in medicine. Thermodynamics of gas mixtures. Humidification	J	•
	nces. Systems with compressible fluids. Measurement of physical parameters in rigid and compliant systems. Basic parts of p of airflow and pressure, gas blenders, etc.). Modelling and analysis of biological systems using electrical analogy, practical ap	-	_
	, biochemical sensors. Haematology analysers. Interference, corrections of measured values, standardisation in medicine. Ele		•
	lectrodes and circuits for biopotential measurement and electrical stimulation. Indirect measuring methods of biological and p		
XP36PAS	Algebraic Specifications Prototyping	ZK	4
Algebraic specification,	syntax and semantics of a specification language (OBJ3), structured specifications, generic specifications, implementation c	of an algebraic spe	ecification,
interpretation using Prol	$og, translation\ into\ Lisp, term\ rewriting\ systems,\ abstract\ rewriting\ machine,\ prototyping\ of\ a\ specification,\ prototyping\ in\ OBJ3,$	conversion to prod	edural language
(C++).			
XP33PAM	Industrial application of multi-agent systems	ZK	4
XP13PSD	Flexible Production Systems	Z,ZK	4
· -	automation. Flexible automation. Basic components of FMS. Machining centres, flexible manufacturing cells and islands. Opti		
	components. Interfaces. Systems of automatical self checking of quality. CNC machines appropriate for FMS. Manipulators a control. CNC for the control of FMS. Flexible assembling systems. Automated plants of future, conception and tasks. Efficienc		-
XP15PEE	Transmission of Electricity	Z,ZK	4
-	ransmission of Electricity transmission systems. Multiple overhead lines. Symmetrical components. Calculation of load flow. Analysis of faulted power s		
	multaneous faults. Special transients in the integrated power systems. Distance and comparison protection relays, principles	=	
interferences in power r	networks, prediction and limitation of disturbances due to non-linear loads. Static stability of the power system and its criteria.	Dynamic stability	of the power
system and its criteria.	Methods for increasing of the stability in power systems. Multimachine transient stability. Reliability of the power transmission	systems.	
XP38PSL	Aircraft Instrumentation	ZK	4
	tudents with the current technology used in aircraft with respect to instruments, systems and sensors working in the low-freq	•	
	tem data. The course includes a detailed description of aircraft instrumentation and its resistance to external influences, a de	-	-
	pineering, analysis of instruments and systems for measurement of engine and aerometric quantities, and a description of emerg		=
· ·	kground related to nowadays technology and methodology utilized on aircraft. The course provides a detailed overview of qu and their integration into signal/data processing and aircraft system design principles. The last part of the course discusses t	•	
the field of aircraft instru		ino ourront publici	mig donvinoo m
XP38PUC		ZK	2
XP37RAD	Radioelectronics	ZK	4
XP36RSY	Reconfigurable Systems	ZK	4
	nfigurability as a part of normal function. Technology of reconfiguration., partially reconfigurable devices. Reconfiguration contr		ent, collaboration
with operating systems,	software support. Design and verification of reconfigurable systems, algorithms, EDA tools. Reconfiguration in System on Ch	ip (SoC). Codesig	n issues in SoC.
Seminars, experiments	with reconfigurable devices, case study, literature research.		
XP35RRD	Robust Control	ZK	4
	lected topics in robust control.		
XP33RSK	Robust Statistics for Cybernetics	ZK	4
	basic tools of control and decision making theory. Classical statistical methods (e.g. MLE) are usually very sensitive to deviat nich are robust have been developed. It means that these methods are not so sensitive to small deviations from an underlying		
•	stimation and then we introduce the robust approach, some basic robust estimators of location (e.g. trimmed mean, Hampel	•	
	inction, breakdown point).		
XP33ROD	Pattern Recognition	ZK	4
	z/wiki/courses/xp33rod/start		
XP04R1	Russian language 1	NIC	
The course is suitable for	or intermediate students who have an equivalent command of the language as someone who has completed book Raduga.	Course objective:	Acquiring the
	to get by in everyday situations and a basic understanding of straightforward technical texts.		
XP04R1ZK	Russian language 1	ZK	0
XP04R2ZK	Russian language 2	ZK	0
XP04R2	Russian Language 2	NIC	
_	cluding messages, summaries, business correspondence and dissertation theses; understanding lectures and other listening sk	ills; note-taking; or	al presentations;
	ation. Russian realia and the way of Russian life.Besides the course books, the supplementary texts and AV aids are used.		
XP35FSC1	Flexible structures control	ZK	4
design of space modes	urse is introduction to methods of modeling flexible mechanics structures in order to optimization of placement of sensors an	d actuators. The r	obust control
XP35FSC	Flexible Structure Control	ZK	4
	urse is introduction to methods of modeling flexible mechanics structures in order to optimization of placement of sensors an		
design of space modes			
XP16JAK	Quality Management	ZK	4
Quality assurance in the	e organization. Statistical methods in quality management. Models of quality systems. Economic issues in quality assurance.	Implementation o	f requirements
of ISO 9001 standard. C	Certification of products and production systems. Recommendations for quality management in the organization.		
XP33RMD	Control of Mobile Robots	ZK	4
	bile Robots. Known Control Architectures. Top-Down and Bottom-Up Approaches. Overview and Comparison. Distributed Autor		_
_	nood Mapping. Needed Sensors. Ground of Ethology. Imprinting. Taxe. Stimuli, Receptors. Multiple Motivated Behaviour. Read	-	
	Robots Structure. Task- or Behaviour-Oriented Robots. Ways and Realisation of Robots Co-operation, Motivation, Observation of Robots Co-operation, Motivation of Robots Co-operation, Motivation of Robots Co-operation, Motivation of Robots Co-operation of Robots Co-op	=	
_	nt reinforcement Learning. Q-Learning. Action Selection Mechanism, Learning Method, Exploration Strategy. Emotional Lear sial Life. Virtual World Different Approaches. Robots Competition, RoboCup, Strategy Selection, Implementation. Open Proble		Approach to
Cymunous biology. Artiflic	sai Ello. Fittaal 17010 Dillototi Approdotios. Nobolo Competition, NoboCup, Citalegy Celection, Impetitentation. Open Flobit	,,,,o.	

XP35CCM Cooperative Control of Multi-agent systems	ZK	4
Cooperative distributed control is a relatively novel and rapidly developing area of control theory and engineering. Instead of centralized, large s	systems are considered	d composed of
autonomous subsystems, with local computation and communication capabilities. The broad aim is solving classical problems e.g. stabilization,	tracking, estimation ar	nd optimization,
via local communication and team cooperation robust to changes in communication topology and disturbance. Relevant topics of classical control	=	
of background mathematics needed for the course is also provided. The potential use of multi-agent cooperation in challenging applications involved.	=	
observed is discussed. Theory: Review of qualitative properties of dynamical systems, Motivation for distributed multi-agent systems, Elements		-
estimation and control, Consensus and synchronization of linear/nonlinear, continuous/discrete-time systems, Cooperative stability, optimality armulti-player game theory, Interactions with environment.	ia robusiness, Distribu	ted optimization:
XP33RSP Management of Software Projects	ZK	4
	ZK	4
XP32RTS Telecommunications Systems Management Telecommunications Systems Management is a discipline which deals problems of interactions of technical and business aspects of management	1	•
services provided.	crit or telecommunication	on networks and
XP15RE Control of Power Systems	Z,ZK	4
Objective functions of power system control, feasibility and algorithms of optimization methods, handling of constrain conditions. Hierarchy and		= = = = = = = = = = = = = = = = = = = =
tasks. System state estimation. Load forecasting and load curve civering. Unit commitment. Optimization of operation with respect to net topolo	· · · · · · · · · · · · · · · · · · ·	_
reactive powers balance. Control of frequency and active powers balance. Optimal power flow. Dynamical models of power stations and system	s.Solution of extraordir	nary states
Dispatch, system and subsidiary services.		
XEP17SWR Scientific Writing	ZK	4
This course is intended to help researchers organize and effectively communicate, in English, their scientific results. While the instructor is an E	Electrical Engineer, the	approaches are
applicable to all technical disciplines.		
XPE04SCWR Scientific Writing	Z	4
1) LECTURES [Chang-Hee Won]: With the assistance of a Fulbright Distinguished Chair at CTU and a Professor in Electrical Engineering for T		
located in Philadelpia, Pennsyvania, USA), researchers will be instructed on how to organize and effectively communicate their scientific results		
Engineer, the approaches will be applicable to all technical disciplines. 2) SEMINARS [Michael Ynsua]: Under the guidance of a native-speaking on the fundamentals of academic writing with the goal of sharpening critical writing skills (reasoning, formulating, and developing arguments are		-
also be paid to mechanics, usage, and style (grammar, etc).	ій ехріанаціонзу. Оресі	ai atterition wiii
XP15SPS Coupled Problems in Heavy Current and Power Engineering	Z,ZK	4
Concept of a coupled problem, classification of the coupled problems typical for heavy cur-rent and power applications. Mathematical description	1 '	= = = = = = = = = = = = = = = = = = = =
between corresponding partial differential equations. Characteristics of electromagnetic-thermal problems (with respecting eventual thermoelasticity),		
and electromagnetic-mechanical problems and also problems based on a com-bination of the electromagnetic field and electric circuits. Formulat	=	
models and algorithms of their solution. Information about available SW, its existing capabilities and perspectives.		
XEP33VKR Selected Topics in Pattern Recognition and Computer Vision	ZK	4
The course deals with fundamental results from computer vision and pattern recognition. The course treats selected key results, as well as late	st areas of research, e	specially those
which substantially influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly to	argeting PhD candidate	es, but is also
available for Msc students with strong interest, possibly experience too, on a research topic that is relevant to the course.		
XP01SPJ Syntax and semantics of a formal language	ZK	4
Syntax and semantics of a formal language. A simple imperative language, assignment command. Denotational and operational semantics, coh		
theory. Fixed points of functionals, recursive definitions. Lambda - notation. A simple function language, denotational semantics. New functions Operational semantics. Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a program		onstructions.
XP39SCG Seminar in Computer Graphics	ZK	4
The Seminar in Computer Graphics will make students familiar with selected research topics from computer graphics srrch ag efficient rendering the seminar in Computer Graphics will make students familiar with selected research topics from computer graphics srrch ag efficient rendering the seminar in Computer Graphics will make students familiar with selected research topics from computer graphics srrch ag efficient rendering the seminar in Computer graphics will make students familiar with selected research topics from computer graphics srrch ag efficient rendering the seminar in Computer graphics will make students familiar with selected research topics from computer graphics srrch ag efficient rendering the seminar in Computer graphics will make students familiar with selected research topics from computer graphics srrch ag efficient rendering the seminar in Computer graphics will make students familiar with selected research topics from computer graphics srrch ag efficient rendering the seminar in Computer graphics will be seminar to the seminar topic familiar with selected research topics from computer graphics srrch against the seminar topic familiar with selected research topics.		•
fheir nntical nronerties qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics metho		
image processing, computer vision, and human computer interaction. The goal ofthe course is to expound the selected topics to students and in the selected topics to students and in the selected topics.		-
skills by analyzing existing high quality research rvork. A significant added value is the acquaintance of students with methods of scientific work	in connection with the	aim of using the
gathered knowledge to solve specific problems of their PhD theses.		
XP39SPG Computer Graphics Seminar	Z,ZK	4
The computer graphics seminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface		
simulation of natural phenomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used		•
image processing, computer vision and human computer interaction based on the particular topics of PhD theses of the participating students.	-	is to introduce
the selected topics to the students and by analyzing selected highly influential research publications to further develop the research capabilities		
XP36SEP Seminars on Architectures of Parallel Computers	ZK	4
Overview of architectures of high-performance computers and trends in technologies. Memory coherence and sequential consistency models. S	•	
and switches, bus-based cache coherence protocols and synchronization mechanisms. Virtual shared memory architectures: distributed cache	COLICIONICE DIVIDUOIS.	, non non neation
mechanisms - barriers, Clusters; fast communication networks and protocols.		
mechanisms - barriers. Clusters: fast communication networks and protocols. XP38SSB Sensors and Buses		4
XP38SSB Sensors and Buses	ZK	4 es and important
XP38SSB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical	ZK principles, sensor type	es and important
XP38SSB Sensors and Buses	ZK principles, sensor type	es and important
XP38SSB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration	ZK principles, sensor type	es and important
XP38SSB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration immunity.	ZK I principles, sensor type and diagnostics, noise	es and important and disturbance
XP38SSB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration immunity. XP38SSA	ZK I principles, sensor type and diagnostics, noise	es and important and disturbance
XP38SSB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration immunity. XP38SSA The course is focused on advanced sensors and data communication principles within heterogeneous automotive networks. It especially deals	ZK I principles, sensor type and diagnostics, noise	es and important and disturbance
XP38SB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration immunity. XP38SSA The course is focused on advanced sensors and data communication principles within heterogeneous automotive networks. It especially deals sensors communication over the internal vehicle communication infrastructure. XP13SID Software in Industrial Engineering Introduction to using of IBM compatible personal computers, their architecture. Using of application programs for mathematics, graphics, text pro-	ZK I principles, sensor type and diagnostics, noise ZK with modern widebanc	es and important and disturbance 3 I automotive
XP38SB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration immunity. XP38SSA The course is focused on advanced sensors and data communication principles within heterogeneous automotive networks. It especially deals sensors communication over the internal vehicle communication infrastructure. XP13SID Software in Industrial Engineering Introduction to using of IBM compatible personal computers, their architecture. Using of application programs for mathematics, graphics, text proof software systems. Introduction to user interface based on Microsoft Windows.	ZK Il principles, sensor type and diagnostics, noise ZK with modern widebanc Z,ZK cessing, database and	and important and disturbance 3 automotive 4 CAD, examples
XP38SSB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration immunity. XP38SSA The course is focused on advanced sensors and data communication principles within heterogeneous automotive networks. It especially deals sensors communication over the internal vehicle communication infrastructure. XP13SID Software in Industrial Engineering Introduction to using of IBM compatible personal computers, their architecture. Using of application programs for mathematics, graphics, text proof software systems. Introduction to user interface based on Microsoft Windows. XP13SSD Special Methods of Devices Quality Evaluation	ZK Il principles, sensor type and diagnostics, noise ZK with modern widebanc Z,ZK decessing, database and	and important and disturbance 3 automotive 4 CAD, examples
XP38SB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration immunity. XP38SSA The course is focused on advanced sensors and data communication principles within heterogeneous automotive networks. It especially deals sensors communication over the internal vehicle communication infrastructure. XP13SID Software in Industrial Engineering Introduction to using of IBM compatible personal computers, their architecture. Using of application programs for mathematics, graphics, text proof software systems. Introduction to user interface based on Microsoft Windows. XP13SSD Special Methods of Devices Quality Evaluation The evaluation of the principal values determining the quality of the passive and active devices. Measuring methods, their evaluation, identification.	ZK Il principles, sensor type and diagnostics, noise ZK with modern widebanc Z,ZK decessing, database and Z,ZK ion of systematic faults	and important and disturbance 3 automotive 4 CAD, examples 4. The description
XP38SB Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration immunity. XP38SSA The course is focused on advanced sensors and data communication principles within heterogeneous automotive networks. It especially deals sensors communication over the internal vehicle communication infrastructure. XP13SID Software in Industrial Engineering Introduction to using of IBM compatible personal computers, their architecture. Using of application programs for mathematics, graphics, text proof software systems. Introduction to user interface based on Microsoft Windows. XP13SSD Special Methods of Devices Quality Evaluation The evaluation of the principal values determining the quality of the passive and active devices. Measuring methods, their evaluation, identification of the tested device, two ports parameters of the device. Matching of the device to the measuring circuit. The noise of the electronic circuits, operations are supplied to the principal values of the device.	ZK Il principles, sensor type and diagnostics, noise ZK with modern widebanc Z,ZK decessing, database and Z,ZK ion of systematic faults	and important and disturbance 3 automotive 4 CAD, examples 4. The description
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XP02SF	Statistical Physics	Z,ZK	4
	to the fundamentals of statistical physics. It is the third part of four-part lecture cycle.	_,_,	
XP37SZS	Statistical Signal Processing	Z,ZK	4
	and detection theory. General properties and fundamental limits. ML, LS, Bayes (MAP,MSE), NP, MM estimators and detectors.	rs. Adaptive filter th	eory (Kalman,
	on and parameter estimation.	NIC	2
XP16SDE XP16STV	Building heritage of the industrial era	NIC ZK	4
	Product Strategy Dicy, pricing and contractation policy, communication, distribution. Marketing mix. Inovations. Concepts of marketing strategy		
	tegic marketing simulation Markstrat.		g oudot
XP36STR	Stringology	ZK	4
	and sequences. General, ordered alphabet. Generalized and weighted strings. Finite and infinite alphabet. Searching in text,		
	ning. Forward and backward matching. Searching in compressed text. Searching in more-dimensional text. Searching for longest	common factors and	d subsequences.
XEP33SML	ies in text. Construction of covering of text. Representation of text, prefix, suffix and factor automata, suffix trees and arrays. Structured Model Learning	ZK	4
	e learning course covers learning and parameter estimation for structured models like Markov Random Fields, Belief Netwo	1	
Networks.			
XP34STV	VLSI Structures and Technologies	ZK	4
	of the IC's. Bipolar and unipolar structures. BiCMOS structures. 3D structures. Sub-micron structures. Memory structures. Tes	-	SI technological
	semiconductor technology. IC design, design of technology. Design rules. Reliability, yield. Outlooks and limitations of IC dev		
XP15ZSS	Light sources and Equipment	Z,ZK	4
XP33SCD	Man-Machine Systems e systems development. Human operator tasks. Manual control, supervisory control cognitive control. Typical structure of a co	ZK	4
	e systems development. Human operator tasks, Mandal control, supervisory control cognitive control. Typical structure of a co- erator and machine. Control levels after Rasmussen. Skill based, role based and knowledge based operator behavior models	-	
	Mental models. Human-machine interaction. Intelligent interface. Factors influencing operator behavior. Stress. Mental load. H	•	•
system reliability. Man	machine systems simulators. User-centered system design.		
XP33SDD	Discrete Event Systems	ZK	4
	e event systems. Modeling of discrete event systems, GRAFCET and it is applications with practical examples. Petri nets over		
in CIM systems.	ns. Reduction methods, formal languages and algebraic description of PNs. Timed PNs and modeling in P- and T-timed PNs.	Practical examples	and applications
XP38SYS	Measurement and Data Acquisition Systems	ZK	4
	the principles and technical means of data acquisition in the laboratory and industrial environment. Attention is paid to both	1	•
the integration of syste	ems for data acquisition and process control. Laboratory exercises are designed in part in the form of classical tasks, partly in	the form of proble	m-oriented tasks
	ning of automated measurement systems and control of measurement processes.		
XP13SRD	Real Time Systems for Process Control	Z,ZK	4
in control of technolog	real time control paradigm. Architecture of real time systems. State transition diagram of real time systems. Semaphore and discal systems	leadlock. Using of r	eal time systems
XP13SJD	Quality Control Systems	Z.ZK	4
	and reliability. Basic quality management systems. ISO 9000, TQM, Kaizen. Basic characteristics of ISO 9000. Quality manu		
and their role in quality	Mathematical model based on factor experiments. Optimization of mathematical model. Six Sigma quality management sys	stem and its implem	nentation. Basic
_	system. Reliability as a subset of quality. Mathematical distributions used in the field of reliability. Usage and maintenance of	efficient. Backup -	types and
	on. Accelerated reliability testing. Processing and analysis of experimental data.	71/	-
XP04S1ZK	Spanish language 1	ZK	0
XP04S1	Spanish language 1 ledge of Spanish language, including the language for specific purposes.Specific technical style characteristics focused on s	NIC	0 nd levis Listenina
_	resentations, understanding the text-all based on intermediate level language.	specific grammar ar	id ickid.Listeriirig
XP04S2ZK	Spanish language 2	ZK	0
XP04S2	Spanish language 2	NIC	0
	istening, understanding a Spanish text of cca 120 pages, writing, speaking). The skills are practiced on writing letters, preser	itations both written	and oral,news
	reparation is necessary. Materials are chosen with regards to the study field of a postgraduate. High-level and fluent speech	is demanded.	
XP37TMP	Medical Instrumentation	ZK	4
	principles and properties of medical systems for analysis of body fluids, blood gas analysis, medical minors of basic life fun principles of anaesthetic equipment and equipment for artificial lung ventilation, haematological analysers and other medical		oxymetry EEG,
XP13TND	Technology of Low Temperatures and Superconductivity	Z,ZK	4
	ples of cooling. Equipments for achievement of low temperatures, liquifiing of gases. Ultralow temperatures. Properties of isc		
- ·	solids at low temperatures. Principles of superconductivity theory, transport currents, stability of superconductivity state, wea	-	-
phenomena. Propertie	s and technology of metallic and high temperature superconductors. Thermal insulation of low temperature equipments. Low ter	nperature thermom	etry. Accessories
	rature laboratory. The use of low temperature technology in practice.		
XP17TVC	Technique of Highly Sensitive Receivers	ZK	4
	ive microwave receivers, mm - wave and submm - wave receivers. Electromagnetic spectrum and noise properties of the Eawave communication. Semiconductors for microwave and millimetre wave bands, SIS detectors, mixers, infrared receivers. Hig	•	
	parameters. Multispectral radiometry and remote sensing, electromagnetic radiation - interference, EMC theory and measu		sters teermology,
XP13TMD	Technological Aspects of Microcomputer Design	Z,ZK	4
	ters, modular design and hardware solution. The data storage technology. The data storage media. The device protection ag	1	influence. The
_	on of equipments. The human machine interface - input and output devices. The ergonomic design of microcomputers and s		-
	is, criteria. The quality control of design and services, the quality of software. The legal aspects of microcomputer use. The c	ontemporary trends	s in industrial
microcomputers. XP13TPD	Technological Processes in Electronic Manufacturing	Z,ZK	А
AP 3 P		1 Z.ZK	4
			nes Comparison
Development of technology	plectrifological Processes in Electronic Manufacturing plogy of packaging. Contemporary methods of packaging of components SOP, DIP, SIP, ZIP, QFP and others, properties, adva diewpoint of environmental resistivity. Classification of multichip modules. Multichip modules of different types: MCM-L, MCM	ıntages,disadvantaç	-
Development of technolog packages from the	ology of packaging. Contemporary methods of packaging of components SOP, DIP, SIP, ZIP, QFP and others, properties, adva	ntages,disadvanta -C, MCM-D, PMCM	. Substrates for
Development of technology of packages from the multichip modules. Technology	ology of packaging. Contemporary methods of packaging of components SOP, DIP, SIP, ZIP, QFP and others, properties, adva viewpoint of environmental resistivity. Classification of multichip modules. Multichip modules of different types: MCM-L, MCM	ntages,disadvanta -C, MCM-D, PMCM	. Substrates for

XP34TOS Technology of Optical Devices	ZK	4
Preparation of optoelectronic materials and structures. Diagnostic and testing methods. Design and preparation of double heterostructures. Preparat	ion of semiconduc	tor waveguides.
Preparation of LED's, lasers, photo-resistors. Preparation of QW structures. Design of dielectric waveguide structures. Preparation of dielectric wave	•	•
preparation of optical radiation distributing structures. Design and preparation of optical radiation control structures. Measurement methods. Testing me	thods. Examples o	f semiconductor
structures. Examples of dielectric structures.		
XP37TEA Theoretical Eletroacoustics	Z,ZK	4
Vibrating systems in fluids and solids. Systems of lumped and distributed parameters in solids. Equivalent circuits of membranes and plates. Recipro electric field. Non-reciprocal transducers (opto and thermoacoustical transducers, piezoresistive transducer). Electromechanical and electroacoustic		-
distributed elements. Radiation, radiation impedance. Acoustic transmitters, directivity. Acoustic receivers. Acoustical systems with lumped and distributed		
air-gaps. Coupled systems.	54 01011101110.71004	olio wavogalaco,
XP37TEM Theoretical Electroacoustics and Measurement	Z,ZK	3
The course is aimed at selected parts of electroacoustics and related fields with the emphasis on the theoretical aspect. The main interest lies in ele	1 ' 1	-
parts. Their description will include non-linear mode. The part on measurement will include mainly calibration methods and their usage in cases clos	e to topics of thes	es of doctoral
students.		
XP02TF1 Theoretical Physics 1	Z,ZK	4
The lecture Theoretical Physics 1 is a basis for the following lectures of theoretical physics for the doctoral study. The main aim is theoretical Mechan	nics - to master the	e description of
motion in curvilinear coordinates.		
XP02TF2 Theoretical Physics 2	Z,ZK	4
The lecture is devoted to the fundamentals of quantum physics in Dirac formalism. It is the second part of four-part lecture cycle.		
XP17TOM Theoretical Optoelectronics in Medicine	ZK	. 5
The course gives to doctoral students from different disciplines the opportunity of both highly theoretical studies and numerical simulations of interactions are studied as a second studies and support of the course of the cou		-
the visible part of the spectrum (and adjacent UV and IR bands) with biological tissues. And to learn about modern optoelectronic sensor concepts a medical therapy and diagnostics. Interdisciplinary topics will be discussed and focused on the benefits and current applications of optoelectronics in	* *	
(such as radiation intensity, etc.) will be formulated and important methods will be described, in particular: radiometry, photometry, eye as a radiation	•	
spectroscopy, interferometry, scattering measurements, integration of spherical theory, etc. Emphasis will be placed on modern theoretical approach		
models), e.g. calculation of the light intensity distribution in biological tissue, theory of radiation transmission (e.g. theory and model Kubelka-Munk),		
with the possibilities of numerical simulations of the given problems by aid of modern SW products (like e.g. COMSOL Multiphysics, SEMCAD / Simulations)	Life, CST, etc.) wh	nich are working
based on numerical methods FDTD, FEM, MoM, Monte-Carlo etc. Operating principle of the optoelectronic reflective and transmissive sensors. Meas		
detection of peripheral blood volume dynamics, clinical examples and typical examination tests. Principles and applications of functional optical imaginary (PDC), potical substances to the property of the p		otical biopsy, IR
Diaphanoscopy, IR thermography, Laser Doppler perfusion imaging (LDPI), Photoplethysmo-graphy imaging (PPGI), optical coherence tomography	1	_
XP37RUP Radio determination of position, theory and practice, experience	Z,ZK	5
The main aim of the subject is to acquaint a doctoral student with receiver position determination methods in systems using different measurements and (least-squares methods) and with their accuracy. The student will study error magnitude derivation and will get information concerning the choice of or	-	-
rates and precision. It will be revealed that massively used satellite navigation methods suffer from many deficiencies under real environment conditio	-	-
of these weaknesses can be reduced by the assistance from other sensors based on radio as well as non-radio principles. Moreover, there are very p		
based on Signals of opportunity processing; they are included in the course, too. The student will verify the achieved results by individual laboratory	project exploiting i	nstrumental
equipment like a signal generator with simulator of satellite signals and generators of communication signals (DVB-T, LTE). The acquisition of the eq	uipment was supp	orted by the
development project OP VVV.		
XP37TAS Acoustic signal processing and theory	Z,ZK	, 4
Acoustic signal classification, sources, description of properties. Statistical analysis of acoustic signals. Spectral analysis of signals, Fourier transforu analysis, Short-time Fourier Transform, Wavelet transform, Wigner-Ville distribution. Cepstral analysis and its application in acoustics. Discrete signal	• • •	
perception. Oversampling, noise shaping. Granulation noise, dithering, signal requantization. Acoustic signal acquisition and data pre-processing. Impulse		
systems. System analysis using swept and time delayed acoustic signals. Pseudorandom signals and their application in acoustic system analysis. Dig		
XP01TGR Graph Theory	ZK	4
Basic course in graph theory. Trees, their characterization, minimal spanning tree. Strongly connected components, rooted trees. Shortest paths, Flo	yds algorithm. Eul	er graphs and
their applications, Hamiltonian graphs and their applications. Chvatal's theorem. Flow in networsk, admissible flows and admissible circulations. Material	chings in general (graphs and in
bipartite graphs. Vertex cover and independent sets. Cliques. Colorings. Plannar graphs. Graphs and vector spaces. The content of the course is mo	dified according to	the needs of
students.		
XP01TJA Languages, Automata and Grammars Finite automata. Nerod theorem and its applications. Nondeterministic automata. Regular expressions nad Kleene theorem. Grammars and their clas	ZK	4
Chomsky hierarchy. CYK algorithm for context-free grammars. Turing machines, decision problem. Algorithmically nonsolvable problems.	Silication. Cothext	-iree grammais.
XP15TOS Theory of Light field	Z,ZK	4
Theory of light field. Mathematical description of emission of unsymmetrical luminaires. Photometry of distante and close point. New characteristics of	1 1	
Flux method calculation of integral characteristics. Light field of surface type and cube type luminaire. Light flux distribution from point source. Distrib	oution of light flux of	of linear source.
Distribution of light flux of surface source. Interreflection theory. Design of indoor illumination using PC.		
XP32TPZ Teletraffic Theory	ZK	4
The aim of the course is to present an overlook of dimensioning of telecommunications networks on the basis of results of the queuing theory (QT). In		
and modeling networks both from the point of view of grade of service GoS and quality ofservice QoS as well. Results of the QT are applied on different to the control of the QT are applied on different to the control of the QT are applied on different to the control of the QT are applied on different to the control of the QT are applied on different to the CT are applied to the QT are applied on different to the QT are applied on the QT are applied to the QT are applied on the QT are applied to the QT are applied on the QT are applied to the QT are applied on the QT are applied to the QT are applied on the QT are applied to the QT	•	
telecommunication networks deploying and operating at time being. Theoretical knowledge about models of service systems can be utilized for dimens in real life - not only in the telecommunication.	sioning of different	service systems
XP31TSS Signal and system theory	ZK	4
Signals and transformations - Laplace and Z-transforms, Fourier transform, cepstra, wavelet transforms. Signal parameterization - AR, MA, ARMA n	1 1	•
classification - spectral distances, Markov models, neural nets, signal prediction.		. a G.g a.
XP02TZP Theory of Sound Field	ZK	4
The aim of this course is deeper understanding the fundamentals of physical acoustics. The continuity equation, Euler and Navier-Stokes equations are	1 1	
from the prime laws of fluid dynamics. These equations are utilized for derivation of a linear wave equation under the acoustical approximation; its sp		
General solutions of the wave equation and Helmholtz equation are formulated using the integrals of Kirchhoff-Helmholtz and Rayleigh. Using these integrals of Kirchhoff-Helmholtz and Rayleigh.	tegrals, some prob	lems of acoustic
radiation and diffraction are studied. Problem of the acoustic field description is further developed using the methods of Fourier acoustics.		
XP17TAM Evaluation of Applicators for Microwave Thermotherapy	ZK	. 4
Lectures are focussed on methodology of evaluation of microwave applicators, which means measurements of SAR distribution in water phantom at distribution in various types of again phantoms. Further design and optimisation of measuring probes is discussed, methodology of probes calibration		
distribution in various types of agar phantoms. Further design and optimisation of measuring probes is discussed, methodology of probes calibratior are described. Numerical modelling of microwave applicators by aid of software product FEMLAB, comparison of mathematical and experimental m		aia evalualiUH
XP33TTM Text mining	ZK	4
·-································		•

XP02UZ	Ultrasound and Quantum Acoustics	ZK	4
The purpose of these le	ectures is to familiarize doctoral students with the issues of ultrasonic waves needed for the design of a wide range of ultrasor	nic devices and to	discuss in detail
the parts that the docto	ral student could use in his work. The subject of the offer is a range of classic and recently developed findings from research.		
XP33UID	Artificial Intelligence	ZK	4
_	sues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving	•	- 1
	e search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creatic	_	ases. Knowledge
-	om examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of pattern reco		4
XP01UAG	Introduction to Algebraic Geometry	ZK	4
	olution sets of systems of polynomial equations in more than one variable and their relationship with the ideals in polynomial er's bases and their properties, Buchberger's algorithm for searching a Groebner's basis, elimination theory, Hilbert's Nullstel	-	
varieties and radicals.	er a bases and their properties, busine iger a algorithm for searching a Groebiter a basis, elimination theory, mibert a mulister	ierisatz, correspoi	nderice between
XP02UEF	Introduction to Electrophysiology	Z,ZK	4
	natomical, physiological and physical aspects of selected electrophysiology problems.	_,,	
XP02UFL	Introduction to Laser Physics	ZK	4
The subject introduces	the basics of laser physics. It explains the principle of laser operation, presents basic terms and describes in detail individual	1 .	ncluding their
construction, characteri	zes the main properties of laser radiation and briefly indicates the possibilities of creating short pulses of radiation. The next	part focuses on th	ne use of lasers
	an activity. It also lists safety principles for working with lasers. In the practical part, it is supplemented by visits to top workplants	aces (e.g. PALS, E	ELI, HILASE)
dealing with the given is			r
XP37ISS	Introduction to space science and technology	ZK	4
	ciences and technology on PhD level. Methods and resources of space research and their applications. Satellites, space prob	=	
	their development, proposals and design. Optoelectronic systems for space, onboard systems and payload, space commun	_	· ·
	gy. Remote sensing and multispectral images, applications. Space physics, cosmic environment, cosmic radiation and particle se software, archiving and data reduction, organization international co-operation.	35. Ground based	segment, tests
XP01UKS	Introduction to Quantum Structures	ZK	4
	n structures. The notions of an orthomodular lattice, orthomodular poset, orthoalgebra, effect algebra, state, center are introd		
	ncluded representations of quantum structures.	acca. Bacic prope	ruoo or quartam
XP01UNA	An introduction to nonassociative algebras	ZK	4
	theory of nonassociative algebra. We introduce the otions of free nonassociative algebra, tensor algebra, bimodules and ire	1	
	tention on the ariety of alternative algebras and composition algebras. We define Lie, alcev and Jordan algebras, their univer-		- 1
XP01USA	An introduction to superalgebras.	ZK	4
	theory of superalgebras. We introduce notions of a graded algebra, superalgebra, Grassmann envelope of a superalgebra. C	onsider varieties	of superalgebras
and identities in supera	lgebras. We pay a big attention on the variety of alternative and Jordan superalgebras.		
XP15UEE	Electric Energy Use and Conservation	Z,ZK	4
XP13VTK	Vacuum technology and cryogenics	Z,ZK	4
Physics of gas. Volumin	ous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Prince	ciples of cooling a	nd constructions
	achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating sy		
	try.Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuur		
XP16HKC	Science, Technics and Technology in the Historic Landscape of the Czech Lands	ZK	4
XP16VTK	Everyday Science and Technology	ZK	4
XP37VRA	Research Seminars in Radioelectronics and Acoustics	Z,ZK	4
	for PhD students of the radioelectronics and acoustics specialization. It develops the presentation skills and serves as a platf	orm for discussion	n and defence of
students' research resu		716	
XP16VPB	Science, Technology and Industrial Boom	ZK	4
XP39VR	Virtual reality	ZK	4
	he VRML language. Standard and non-standard extensions to the VRML language. Programming of external applications with	n EAI Interface. M	ulti-user virtual
	ion in virtual environment. Hardware and software support for virtual reality systems. QuickTime VR. Specification X3D.	7.71/	4
XP02VNP	Plasma Waves and Instabilities a will be introduced in the first part of the lecture (dispersion relation, phase and group velocities, Fourier analysis). Fundame	Z,ZK	reion rolations
· ·	linearized MHD equations (magnetoacoustic waves - Alfven, F and S wave; electromagnetic waves in plasma - O, X, R, L wa		
	e devoted to final size waves, nonlinear phenomena (Landau damping) and solitons in plasma.	avo, oivii t diagram	1). 1110 0000114
XP16DEL	History of technology and economic	ZK	2
XP37VKF	Selected Parts from Photonics	ZK	4
_	y of vision. Integral photonic sensors. Panoramatic (image) photonic sensors. Integral photonic displays. Panoramatic photon	1	
, , , ,	tonic elements. Basic elements of optical systems. Fundamentals of illumination. Fiber-optics elements and systems. Optical n		
Optical (photonic) proce	essors.		
XP37FOT	Selected Parts from Photonics	Z,ZK	3
The subject is focused of	on the overview of recent applied photonic topics esp. integral and panoramic photonics receivers, transmitters and other spec	ial elements and	subsystems incl.
relevant theoretical bac	kground. Selected examples of applied photonic elements and subsystems will be demonstrated in lab experiments and resu	ults of ESA space	projects. Lab
· ·	e in the specialized departmental laser lab for limited number of participants. Selected experiments will also be presented during	ig lectures. The du	ırable equipment
· ·	oject frame will be exploited.		
XP38VKP	Selected Parts of Instrumentation	ZK	4
	d to principle, properties and applications of selected special measuring instruments. It deals mainly with calibrators and othe nt of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC r		- 1
	nt of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC r optical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me		
XP01TEM	Selected chapters of the measure theory	ZK	4
!	p Selected Chapters of the measure theory tely additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the	1	
1	rski technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem.	or midt	,
XP33KSI	Sotware Engineering - Selected chapters	ZK	4
XP38VKZ	Selected Chapters of Signal Processing	ZK	4
	d to advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns	1	
	Fourier), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality		
transmission, etc.			

VD20VDI			
XP38VDI	Selected Chapters of Diagnostics	ZK	4
This course introduces a	dvanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, an	d principles and i	nstrumentation
	g, the corresponding advanced signal processing, and self-acting evaluation in order to improve reliability, availability, mainter	nance, and life-tir	ne.
	Selected Parts of Data Mining	ZK	4
•	aling non-trivial, hidden and ultimately applicable knowledge in large data. This course focuses on two key data mining issues:		
	data, it is important to resolve both the technical issues such as distributed computing or hashing and general algorithmic co		
	by case studies on web and social network mining. The second part will discuss approaches that merge heterogeneous prio the main application field here. It is assumed that students have completed the master course on Machine Learning and Dat	=	
			4
	Selected topics in probability and mathematical statistics erms of probability and procedures of mathematical statistics that go beyond commonly taught methods.	ZK	4
1	Artificial Intelligence	ZK	4
	unication with a computer, phases of processing, syntactic analysis, grammars including DCG. Understanding a sentence, se	ı	-
	ation. Knowledge engineering and knowledge elicitation. Machine learning -review of methods and tools. PAC learning. Learning		•
and scheduling.			,, . <u>.</u> g
	Selected Chapters from Antennas and Propagation	ZK	4
	nd modern antenna technology. Selected problems of antennas and propagation for fixed and mobile communication, earth a		=
	t services and communication. Topics of near a far field antenna measurement, compact antenna measurement. Measureme		
services. Antenna anech	oic chambers design.		
XP02VPA1	Selected Topics of Physics 1	ZK	4
XP02VPA2	Selected Topics of Physics B	ZK	4
XP02VPB	Selected Topics of Physics B	Z,ZK	4
XP02VPO	Selected Topics of Optics	Z,ZK	4
	equation, plane wave, polarization, reflection and refraction, natural and artificial anisotropy, optical modulators, coherence, interf	' '	-
	g, holography, methods of visualization, normal and anomalous dispersion, optical image formation, optical devices, photome		
stimulated emission, las		<i>3.</i>	
XP33ROZ	Selected Topics in Pattern Recognition	ZK	4
	rse in pattern recognition (e.g. P33ROD, 33RPZ). Selected topics: Anderson's problem, Kozince algorithm, kernel perceptron		discriminant.
•	Deterministic learning. Unsupervised learning: Robbins algorithm and emprirical Bayesian approach. Expectation-minimizat		
sequences and directed	acyclic graphs. Markov models. Combination of weak classifiers: boosting and bagging. AdaBoost.		
XP16MVE	Selected Problems of Economy and Management of Energy	ZK	4
The role of production p	ocess in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning wit	h respect to prod	uction typology.
Standardized basis of pr	oduction management, standardization. Controlling, production management methods.		
XP37SFA	Fundamentals of Physical Acoustics	ZK	4
•	city, Carthesian tensors. Theory of small deformations, dynamic equations of isotropic elastic medium. Microscopic model of	fluids. Cinematics	s of fluids.
	ids. Stationary flow of vascous fluid.		
XP16STM	Selected Statistical Methods	ZK	4
	nsformation of random variables. Aproximation of theoretical distributions. Interval estimates. Hypothesis testing. Simple and mu	ultiple regression.	Analysis of time
series.Index number.		714	
XP36VAV		ZK	4
XP39VPG	Computational Geometry	ZK	4
Principles of computation	nal geometry (CG), data structures and paradigms, methods of geometric search, convex polygons and hulls, applications of		
		f convex hull, prox	• •
Voronoi diagrams, triang	ulation, efficient intersection algorithms, intersection of semispaces and polygonal regions, geometry of rectangles, dual map	f convex hull, prox	• •
Voronoi diagrams, triang dual space, algorithms of	ulation, efficient intersection algorithms, intersection of semispaces and polygonal regions, geometry of rectangles, dual man f computer graphics and CG. Students who completed course 36VGE cannot enroll.	f convex hull, prox opings and space	s, convex hull in
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KP33KHD	Introduction to Game Theory	ZK	4
	orief survey on classical and contemporary theory of games. It includes the elements of the utility theory, decision-making theory, so	1	non-cooperativ
ames (balance an	d minimax) and the basic concepts of coalition games, especially its solutions (core and value) and relation to the market model	S.	·
P33ZPM		ZK	4
(P33ZVD	Introduction to Computer Vision	ZK	4
	ot exist anymore. Its last lecture run in the academic year 2021/2022.	211	-
P33POS		ZK	4
	Fundamentals of Possibilistic Measures	1 .	
	es present a mathematical tool for uncertainty (randomness) quantification and processing applying the notions and apparatus c pilistic measures in the sense that they are based on the maxitivity priciple in spite to the additivity principle applied in the standa		-
-	that the operation of maximum (supremum) can be defined also in certain non-numerical structures, possibilistic measures takin	-	-
	ar, in complete lattices, are worth being investigated. The lecture will not suppose any preliminary knowledge in fuzzy set theory		•
easure and proba		, latiloo trioory or t	no otanaara
P33TPS	Foundations of the Possibilistic Measures	ZK	4
	y measures can be sen as an alternative mathematical model for uncertainty quantification and processing, topical and intensiv	1	
· · · · · · · · · · · · · · · · · · ·	axitivity principle replacing the additivity principle applied in the classical measure theory. Besides the real-valued possibilistic m		· -
	es taking their values in complete lattices will be introduced and analyzed.	leasures also non-	Humencai
		71/	1
P01ZOA	Fundamentals of the theory of operator algebras	ZK	4
	theory of operator algebras aimed at the theory of C* algebras and von Neumann algebras in its concrete Hilbert space represe		-
	presentations are studied. Comparison theory of projections, states and representations is explained. Von Neumann algebras are	e ciassined as imile	and mimile a
ructural types I, II,		71/	4
P16ZVP	Fundamentals of Scientific Work	ZK	4
P01ZWT	Wavetet Transform.	ZK	4
	tinuous wavelet transform. Time and frequency localization. Discrete wavelet transform. Riesz bases and frames. Multiresolution	analysis. Applicat	ions to signal
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List of courses of this pass:

Code	Name of the course	Completion	Credits
XEP17SWR	Scientific Writing	ZK	4
This course is inten	ded to help researchers organize and effectively communicate, in English, their scientific results. While the instructor is an Electrical	Engineer, the appl	roaches are
	applicable to all technical disciplines.		
XEP33CML	Computational Intelligence Techniques for Machine Learning	Z,ZK	4
Learning objective:	ecome familiar with the theory and applications of computational intelligence methods in the context of systems capable of learning froi	n data. Introduction	n, motivation
for learning, comp	utational intelligence. Supervised, unsupervised and reinforcement learning paradigms. Fuzzy systems, neural networks, neuro-fuzz	y systems, and oth	ner general
function approxima	ators for supervised learning. Fuzzy clustering methods for unsupervised learning. Reinforcement learning for single-agent and multi	-agent systems. Ex	xamples of
	applications and case studies. The course will be connected with - a computer assignment with Matlab/Simulink and a literature assignment with Matlab/Simulink and a literature assignment with Matlab/Simulink and a literature	signment.	
XEP33FLO	Fuzzy Logic	ZK	4
·	Basics of fuzzy sets and fuzzy logic. Measures on collections of fuzzy sets. Principles of fuzzy control.		
XEP33GMM	Graphical Markov Models	ZK	4
The course was ta	ught in WS 2023/24 for the last time. It will not be opened anymore. Markov models on graphs represent a model class widely applied	d in many areas o	f computer
science, such as co	mputer networks, data security, robotics and pattern recognition. The first part of the course covers inference and learning for Marko	v models on chain	s and trees.

All these tasks including structure learning can be solved by efficient algorithms. The second part addresses graphical models on general graphs. Here on the contrary, practically all inference and learning tasks are NP-complete. The focus is therefore on efficient approximative algorithms. XEP33NEP Z.ZK 4 Neuroprosthetics Neuroprosthetics is concerned with the use of artificial devices to replace or improve the function of the human nervous system. The neuroprosthetic device in most widespread use is the cochlea implant with approximately 150,000 in use worldwide. In this course we will look at the different technologies involved, particularly in terms of implant construction and materials and their practical use. We will also see how such implants interact with the human nervous system, forming a bidirectional gateway both to monitor signals on the nervous system and to directly stimulate the human brain. As well as witnessing the exciting development of the field we will consider neuroprosthetics in terms of practical restorative use, not only in Cochlea implants but also for visual and motor repair. We will however also look at the possibilities of Neuroprosthetics for general human enhancement and investigate how the presenters own self experimentation fits into teh field. Whilst the course will focus on technical issues, it will be presented in a general way such that all students should be able to follow (i.e. a mathematical background is not a requirement). Indeed as this technology has immediate impact, societal, ethical and moral issues raised will also be discussed. The course is complementary to the lecture course given on Bionics: this set of lectures being specifically concerned with neural aspects - linking the human brain and nervous system with technology. XEP33NUM Numerical Analysis The course introduces to basic numerical methods of interpolation and approximation of functions, numerical differentiations and integration, solution of transcendent and (ordinary and partial) differential equations and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demonstration of their properties using Maple and computer graphics. XEP33SML Structured Model Learning ZK This advanced machine learning course covers learning and parameter estimation for structured models like Markov Random Fields, Belief Networks and (stochastic) Deep Neural Networks. XEP33VKR Selected Topics in Pattern Recognition and Computer Vision 7K The course deals with fundamental results from computer vision and pattern recognition. The course treats selected key results, as well as latest areas of research, especially those which substantially influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeting PhD candidates, but is also available for Msc students with strong interest, possibly experience too, on a research topic that is relevant to the course. XEP35CMS Computational Methods for Materials Science The final goal of the course is to acquire advanced knowledge of Classical and Quantum Mechanics to design in-silico experiments within the Materials Science field. At the end of the course, the students will know: - the fundaments of thermodynamics, newtonian and statistical mechanics, and how the relative formalism is implemented in order to calculate thermodynamical properties; - how the Schrödinger equation is setup and solved in order to calculate physical quantities; - how to combine the classical and quantum mechanics to model experimental results; and - a general protocol through which to design new materials at the atomic scale. By means of simulation laboratory experience, the students will eventually learn how to setup and run simulations, and how to analyse and present the results by using post-processing softwares. XEP36AGT **Advanced Computational Game Theory** ZK 4 XP01EAL Effect algebras ZK 4 Bsic course on effect algebras. Effect algebras, MV-effect algebras, various types of elements, compatibility, partitions, states XP01EKM ZK Mathematics Models for Economics 4 This course is an introduction to the theory of time series and random processes used in economics for describing values (financial assets, product prices, financial loss) randomly developing in time will be shown. Further, the terms of stochastic differential and stochastic integral are introduced. XP01FA1 Functional Analysis 1 7K 4 Measure theory and Lebesgue integral. An introduction to Hilbert spaces. Theory of linear operators in Hilbert spaces. Spectral theory. XP01ITZ Integral Transforms and Z Transform ZK 4 Basic types of integral transforms, linearity. Laplace transform, inversion, limit theorems. Fourier transform. Application to solving integral and differential equations. Introduction to distribution theory, Fourier and Laplace transforms of distributions. Linear dynamic systems, causality, passivity, convolution. Systems with bounded spectrum. Z-transform and difference equations. XP01KAS Complexity and Combinatorical Algorithms Time and space complexity of algorithms. P and NP problems and their solutions: exact solutions, heuristics, approximation schemes, probabilistic algorithm. Equivalences of problems. XP01KVP **Quantum Computing** ZK Quantum computing represents a new programming paradigm. The safety of nowadays encypering techniques is based on enormous computation complexity of classical mathematical problems. This safety may be broken by quantum computers. The ``building stones" of a quantum computer and quantum computers will be developed during the course. We will design fast factorization algorithms, fast database search, etc. XP01MKR Mathematics for cryptography ZK 4 Introduction to the theory of groups, finite fields, and polynomials over finite fields and their applications in cryptography XP01MST Mathematical Statistics ZK 4 Random sampling, ordered sampling and their distributions. Sample statistics, Point estimates and interval estimates. Confidence intervals, Estimations, unbiased and consistent estimates. Hypothesis testing for distribution parameters. Hypothesis testing for equality of parameters. Nonparametric tests. Regression analysis. Matrix Calculus Similar matrices. Jordan blocks, Jordan canonical matrices. Real canonical form of a real matrix. Characteristic and minimal polynomial. Caley-Hamilton thoerem. Functions of matrices exponential matrix. Symetric, orthogonal and positive matrices. Diagonalization of symetric, positive and circulant matrices. Singular value decomposition. Moore-Penrose pseudoinverse matrix. Generalized solution of systems of linear equations. Mathematical Methods in Signal Theory Continuous, discrete, periodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and Shannon-Kotelnikov. Modulation. Analytic signals. XP01NLA ZK 4 Numerical Linear Algebra Background matrix algebra. Norms of vectors and matrices. Numerical linear algebra. Special systems. Eigenvalues and eigenvectors. Iterative methods. Matrix inversion. Singular value decomposition. Generalized solutions of linear systems. XP01PDR Partial Differential Equations ZK 4 Problems in partial differential equations of mathematical physics. Initial and boundary value problems. The method of characteristic functions, integral form and numerical methods XP01POA Advanced theory of operator algebras ZK 4 Some advanced aspects of the theory of operator algebras are treated. In particular, structure of ideals, convex structure of the state space, tensor products, cross products, and modular theory. XP01SPJ Syntax and semantics of a formal language ZK Syntax and semantics of a formal language. A simple imperative language, assignment command. Denotational and operational semantics, coherence theorem. Mathematical domain theory. Fixed points of functionals, recursive definitions. Lambda - notation. A simple functionl language, denotational semantics. New functions definitions, recursive constructions. Operational semantics. Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming language.

XP01TEM Basic properties	Selected chapters of the measure theory of finetely additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the experience of the measure of the measure theory and the Carathéodory theorem).	ZK stension of finatel	4 v additive
	measures (the Horn-Tarski technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theore		y dddiiivo
their applications,	Graph Theory aph theory. Trees, their characterization, minimal spanning tree. Strongly connected components, rooted trees. Shortest paths, Floyds Hamiltonian graphs and their applications. Chvatal's theorem. Flow in networsk, admissible flows and admissible circulations. Matchin/	ngs in general gra	phs and in
XP01TJA	students. Languages, Automata and Grammars	ZK	4
	erod theorem and its applications. Nondeterministic automata. Regular expressions nad Kleene theorem. Grammars and their classifica Chomsky hierarchy. CYK algorithm for context-free grammars. Turing machines, decision problem. Algorithmically nonsolvable prol	ation. Cotnext-free	
XP01UAG	Introduction to Algebraic Geometry	ZK	4
	the solution sets of systems of polynomial equations in more than one variable and their relationship with the ideals in polynomial rings bebner's bases and their properties, Buchberger's algorithm for searching a Groebner's basis, elimination theory, Hilbert's Nullstellensa		
XP01UKS	varieties and radicals. Introduction to Quantum Structures	ZK	4
	antum structures. The notions of an orthomodular lattice, orthomodular poset, orthoalgebra, effect algebra, state, center are introduced. structures are studied included representations of quantum structures.		
	An introduction to nonassociative algebras in the theory of nonassociative algebra. We introduce the otions of free nonassociative algebra, tensor algebra, bimodules and irepre y a big attention on the ariety of alternative algebras and composition algebras. We define Lie, alcev and Jordan algebras, their universe		
XP01USA	An introduction to superalgebras. The theory of superalgebras. We introduce notions of a graded algebra, superalgebra, Grassmann envelope of a superalgebra. Consider and identities in superalgebras. We pay a big attention on the variety of alternative and Jordan superalgebras.	ZK	4
XP01VPS	Selected topics in probability and mathematical statistics Students will learn the terms of probability and procedures of mathematical statistics that go beyond commonly taught method	ZK ds.	4
	Fundamentals of the theory of operator algebras he theory of operator algebras aimed at the theory of C* algebras and von Neumann algebras in its concrete Hilbert space representa epresentations are studied. Comparison theory of projections, states and representations is explained. Von Neumann algebras are class		
VD047W/T	structural types I, II, III.	71/	4
XP01ZWT Hilbert spaces. Co	Wavetet Transform. ontinuous wavelet transform. Time and frequency localization. Discrete wavelet transform. Riesz bases and frames. Multiresolution and processing.	ZK alysis. Application	4 s to signal
XP02AMA	Active Methods in Acoustics	ZK	4
Physical principles	s, interference, Huygens principle, sound field in ducts, vawe-guides and enclosures. Active noise control in a duct. One or more secon stic coupling, modes, local control. Feedback and feedforward strategy, analog adn digital realisations, algorithms based on LMS, stabili algorithms. Practical realisations of active systems. Active control of vibrations, transducers for active control.	ndary sources. Ac	tive control
XP02AME	Active Methods in Acoustics	ZK	
XP02BFY	Biophysics	Z,ZK	4
	s related to blood flow, measurement of haemodynamic parameters in vivo, properties of blood vessels. Special attention will be given ion in treatment of renal or lung insuficiency. The students will learn how to measure blood pressure under various degrees of load and	•	
XP02DP	ventilation parameters. Theoretical knowledge will be complemented by practical experience from excursions. Electric Discharges and their Applications	ZK	4
Classification of e	electric discharges. Townsend?s theory. Glow discharge. Processes on the surface of electrodes. Technological applications. Plasma di arge. Arc. Corona. Spark discharge. Lightning. Ball lightning. Z-pinch and its properties. Electromagnetic collapse. X-ray sources, contragged in magnetic fields of Earth.	isplays. High-freq	uency and
XP02EVA	Physics for Electroenergetics	ZK	4
	lected parts of physics for students of electric power engineering: Physical principles of gas discharges - glow, arc, spark and corona disc me acquainted with characteristics for magnetized, astrophysical and fusion energy generation. A part of the course is two excursions in Academy of Sciences.	•	
XP02FPL	Solid State Physics The course provides fundamentals of solid state physics at large.	ZK	4
XP02FPT	Physics for Therapy	Z,ZK	3
	focused to Over Using Syndrome problems. Besides that, there will be discussed pain treatment for patients with cancer. A significant visiotherapy and phototherapy. Also healing processes, organ conservation methods and progressive surgery methods will be spoken a many practical knowledge via labe.		
	many practical knowledge via labs.		1
XP02HS	Noise Surveys	7K	4
XP02HS Sound field, noise	Noise Surveys e and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise mapper sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control		4 d types of
	e and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise mappe	oing, principles ar	l
XP02MHD XP02MPF	e and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise maps sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control Magnetohydrodynamics Qualitative description of the behaviour of hot plasma in magnetic fields	oing, principles and l. ZK	nd types of
XP02MHD XP02MPF XP02PT	and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise mapper sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control Magnetohydrodynamics Qualitative description of the behaviour of hot plasma in magnetic fields Plasma Technologies	oing, principles ar l. ZK Z,ZK ZK	d types of 4 2 4
XP02MHD XP02MPF XP02PT XP02SF	e and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise maps sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control Magnetohydrodynamics Qualitative description of the behaviour of hot plasma in magnetic fields	oing, principles and l. ZK Z,ZK ZK ZK Z,ZK	nd types of 4
XP02MHD XP02MPF XP02PT XP02SF XP02TF1	A and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise mapper sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control Magnetohydrodynamics Qualitative description of the behaviour of hot plasma in magnetic fields Plasma Technologies Statistical Physics The lecture is devoted to the fundamentals of statistical physics. It is the third part of four-part lecture cycle. Theoretical Physics 1	zing, principles and l. ZK Z,ZK ZK ZK Z,ZK Z,ZK Z,ZK Z,ZK	d types of 4 2 4 4 4
XP02MHD XP02MPF XP02PT XP02SF XP02TF1	and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise mapper sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control Magnetohydrodynamics Qualitative description of the behaviour of hot plasma in magnetic fields Plasma Technologies Statistical Physics The lecture is devoted to the fundamentals of statistical physics. It is the third part of four-part lecture cycle.	zing, principles and l. ZK Z,ZK ZK ZK Z,ZK Z,ZK Z,ZK Z,ZK	d types of 4 2 4 4 4

XP02TZP	Theory of Sound Field	ZK	4
	rse is deeper understanding the fundamentals of physical acoustics. The continuity equation, Euler and Navier-Stokes equations and the		
•	ws of fluid dynamics. These equations are utilized for derivation of a linear wave equation under the acoustical approximation; its spe		
General solutions o	f the wave equation and Helmholtz equation are formulated using the integrals of Kirchhoff-Helmholtz and Rayleigh. Using these integrals and diffraction are studied. Problem of the acoustic field description is further developed using the methods of Fourier ac	-	is of acoustic
XP02UEF	Introduction to Electrophysiology Course is oriented on anatomical, physiological and physical aspects of selected electrophysiology problems.	Z,ZK	4
XP02UFL	Introduction to Laser Physics	ZK	4
	duces the basics of laser physics. It explains the principle of laser operation, presents basic terms and describes in detail individual ty		luding their
construction, chara	acterizes the main properties of laser radiation and briefly indicates the possibilities of creating short pulses of radiation. The next par	t focuses on the u	use of lasers
in various areas	of human activity. It also lists safety principles for working with lasers. In the practical part, it is supplemented by visits to top workplace	es (e.g. PALS, EL	.I, HiLASE)
VP00117	dealing with the given issue.	71/	$\overline{}$
XP02UZ	Ultrasound and Quantum Acoustics se lectures is to familiarize doctoral students with the issues of ultrasonic waves needed for the design of a wide range of ultrasonic c	ZK	Luce in detail
	e parts that the doctoral student could use in his work. The subject of the offer is a range of classic and recently developed findings fr		Juss III uetali
XP02VNP	Plasma Waves and Instabilities	Z,ZK	4
Basic wave pheno	mena will be introduced in the first part of the lecture (dispersion relation, phase and group velocities, Fourier analysis). Fundamenta		on relations
will be derived from	m the linearized MHD equations (magnetoacoustic waves - Alfven, F and S wave; electromagnetic waves in plasma - O, X, R, L wave	, CMA diagram).	The second
\/===\/=+	part of the lecture will be devoted to final size waves, nonlinear phenomena (Landau damping) and solitons in plasma.		
XP02VPA1	Selected Topics of Physics 1	ZK	4
XP02VPA2	Selected Topics of Physics B	ZK	4
XP02VPB	Selected Topics of Physics B	Z,ZK	4
XP02VPO	Selected Topics of Optics	Z,ZK	4
-	vave equation, plane wave, polarization, reflection and refraction, natural and artificial anisotropy, optical modulators, coherence, interfere grating, holography, methods of visualization, normal and anomalous dispersion, optical image formation, optical devices, photometry		
difficultin, option	stimulated emission, lasers.	, coloriinoti y, ator	no radiation,
XP02ZFP	Fundamentals of the Plasma Physics	ZK	4
This course will p	provide you with a basic knowledge of plasma physics and of its applications. Plasma definition. Main plasma characteristics. Collision	is of charged part	icles. Fluid
	model Magneto-hydrodynamics. Aplications.		
XP04A1	English language 1	NIC	ļ
The course revises	general English from previous studies, further develops speaking skills, listening and recalling spoken English as well as note-taking	skills. Provides ba	asic scientific
XP04A1ZK	terminology (cause-effect relationship, definitions, classification, basic information on composing written documents).	ZK	0
	English language 1 is only for those postgraduate students studying in older study program valid up to Sept.2003 and did not ask for studying languages		"
	program.	· according to mic	
XP04A2	English language 2	NIC	
	ing written documents (papers, reports, articles, dissertations, official letters); oral presentations, reading skills (getting both general		
art of understand	ling speech in a foreign language; selected parts of difficult grammar; selected items focused on practical skills (reading mathematic	al symbols and ex	pressions,
VD044007K	writing CV). Oral presentations.	71/	$\overline{}$
XP04A2SZK XP04A2ZK	English Language English language 2	ZK ZK	0
	English language 2 ect is only for those postgraduate students who study in older program valid up to Sept.2003 and did not ask for studying the new lan	1	1 0
XP04AZK	English Language	ZK	0
7.1. O 17.1	http://www.fel.cvut.cz/anketa/aktualni/courses/XP04AZK		' '
XP04C1ZK	Czech language 1	ZK	0
XP04C2ZK	Czech language 2	ZK	0
XP04F1	French language 1	NIC	
_	of grammar and vocabulary, with the emphasis on technical style; ability to understand technical texts on an intermediate level (teste	-	60 pages of
	exts). Oral presentations - ability to talk on subjects studied by the postgraduate student. Writing cover letters , CV, answering advertise.		
XP04F1ZK	French language 1	ZK	0
XP04F2	French language 2 ency both in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult te	NIC	obonsion of
	is). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, (both language and content level studied by postg		
(b.a.a.	skills related to job applications, cover letters etc.	,	
XP04F2ZK	French language 2	ZK	0
XP04MIN	English Language 2	ZK	0
-	m of defense of professional study in English. The task of the doctoral student before the committee to defend his professional work dra		-
As part of the subs	equent discussion. PhD student is evaluated in presentation skills, mastery of the language in continuous speech and language skills	quickly and corre	ctly respond
XP04N1	during the debate . Account is also the linguistic correctness of written text.	NIC	1
-	German language 1 h the emphasis on professional language. Listening to authentic technical texts from areas of electrical engineering , eliciting basic info	1	l text. Reading
	professional texts regarding the needs of postgraduate students. Training of various reading skills. Writing technical texts on specific t		- 1
	ons for advanced students based on 5 video tapes about these topics: postgraduate studies, professions, internships abroad, profess		
	profession of an engineer. Revising and extending typical grammar for technical style, syntax of technical texts.		
XP04N1ZK	German language 1	ZK	0
_	h the emphasis on professional language. Listening to authentic technical texts from areas of electrical engineering, eliciting basic info		-
	professional texts regarding the needs of postgraduate students. Training of various reading skills. Writing technical texts on specific t ons for advanced students based on 5 video tapes about these topics: postgraduate studies, professions, internships abroad, profess		
	profession of an engineer. Revising and extending typical grammar for technical style, syntax of technical texts.		,

\/B04N0			1
XP04N2	German language 2 used on extending and elaborating grammar and conversation, namely on professional language skills (reading + writing technical text	NIC	re roviowe
THE COURSE IS IUCU	used on extending and elaborating grammar and conversation, namely on professional ranguage skills (reading + writing technical text presentations etc.)	o, preparing pap	oro, reviews
XP04N2ZK	German language 2	ZK	0
XP04R1	Russian language 1	NIC	
The course is sui	litable for intermediate students who have an equivalent command of the language as someone who has completed book Raduga. Collanguage skills required to get by in everyday situations and a basic understanding of straightforward technical texts.	ırse objective: Ad	quiring the
XP04R1ZK	Russian language 1	ZK	0
XP04R2	Russian Language 2	NIC	
Writing technical te	exts including messages, summaries, business correspondence and dissertation theses; understanding lectures and other listening skills; n structures and pronunciation. Russian realia and the way of Russian life.Besides the course books, the supplementary texts and AV aic	ote-taking; oral p	resentations
XP04R2ZK	Russian language 2	ZK	0
XP04S1	Spanish language 1	NIC	0
	knowledge of Spanish language, including the language for specific purposes. Specific technical style characteristics focused on specific comprehension, oral presentations, understanding the text-all based on intermediate level language.		_
XP04S1ZK	Spanish language 1	ZK	0
XP04S2	Spanish language 2	NIC	0
	kills(listening,understanding a Spanish text of cca 120 pages, writing, speaking). The skills are practiced on writing letters, presentation		d oral,new
etc. Indi	dividual home preparation is necessary. Materials are chosen with regards to the study field of a postgraduate. High-level and fluent spe	ech is demande	d.
XP04S2ZK	Spanish language 2	ZK	0
XP04 1	Czech language 1	NIC	0
XP04 2	Czech language 2	NIC	0
XP12IMM	Engineering Methods in Mechanics	Z,ZK	4
	solution of problems in rigid bodies mechanics, hydromechanical, thermodynamic and electromechanical systems. Dynamics of combined		
	analytical mechanics, assembling of mathematical model and resources for simulation. Identification of system parameters with respect		tances and
	energy losses. Physical similarity and analogy, dimensional analysis, dimensionless parameters, PI-terms, fundamentals of experiment		
XP12VVM Research of con	Development and Research of Materials mposite materials wth specific electrical properties. Diagnostics of materials in electrotechnology. Polymers. Phase transitions. Thin and polymers. Organic solar cells. Models of function of biomaterials.	Z,ZK I thick conductive	5 layers on
\/D40DEZ	Degradation processes of electridal equipment	Z,ZK	4
XP13DEZ			1
XP13DEZ The course familian	arizes students with the basic processes of degradation, which is exposed to the electrical product in a production environment. The stud	dent will apply thi	a Kilowieu(
The course familia	arizes students with the basic processes of degradation, which is exposed to the electrical product in a production environment. The stud duct for a model operating environment. The student should try to verify the dominant degradation process of the product in the laborat		_
The course familiant to a specific prod		ory or perform its	_
The course familian to a specific proc simula XP13DFD Technological syste Methodology of an	duct for a model operating environment. The student should try to verify the dominant degradation process of the product in the laborat ation. Attention is also paid to environmental aspects associated with the choice of materials (technology) that are able to limit the degradation. Attention is also paid to environmental aspects associated with the choice of materials (technology) that are able to limit the degradation. Attention is also paid to environmental aspects associated with the choice of materials (technology) that are able to limit the degradation of production Systems Data and Functional Analysis of Production Systems. Tools of control and information of enalysis of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of data	ory or perform its adation process. Z,ZK nterprise, distribute a and material flo	computer 4 ted system ws analysi
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XP13SID			1
	Software in Industrial Engineering	Z,ZK	4
ntroduction to using	of IBM compatible personal computers, their architecture. Using of application programs for mathematics, graphics, text processing, do	atabase and CA	D, examples
VD40C ID	of software systems. Introduction to user interface based on Microsoft Windows.	7 71/	1 4
XP13SJD	Quality Control Systems ty and reliability. Basic quality management systems. ISO 9000, TQM, Kaizen. Basic characteristics of ISO 9000. Quality manual. Qua	Z,ZK	4
	lity. Mathematical model based on factor experiments. Optimization of mathematical model. Six Sigma quality management system ar		-
	igma system. Reliability as a subset of quality. Mathematical distributions used in the field of reliability. Usage and maintenance coeffici	•	
	mathematical description. Accelerated reliability testing. Processing and analysis of experimental data.	5151111 <u>2</u> 45114p	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
XP13SRD	Real Time Systems for Process Control	Z,ZK	4
	of real time control paradigm. Architecture of real time systems. State transition diagram of real time systems. Semaphore and deadlock	•	I
	in control of technological systems.		
XP13SSD	Special Methods of Devices Quality Evaluation	Z,ZK	4
The evaluation of the	principal values determining the quality of the passive and active devices. Measuring methods, their evaluation, identification of systems	ematic faults. Th	e description
of the tested device	ce, two ports parameters of the device. Matching of the device to the measuring circuit. The noise of the electronic circuits, optimal no	ise and power	matching.
	Non-linearity of the "linear" circuits, intermodulation distortion, measuring of the non-linearity and intermodulations.		1
XP13TMD	Technological Aspects of Microcomputer Design	Z,ZK	4
	puters, modular design and hardware solution. The data storage technology. The data storage media. The device protection against e		
•	ondition of equipments. The human machine interface - input and output devices. The ergonomic design of microcomputers and speci		
microcomputer sys	stems, criteria. The quality control of design and services, the quality of software. The legal aspects of microcomputer use. The conten microcomputers.	nporary trends i	n industriai
VD12TND	Technology of Low Temperatures and Superconductivity	7 7V	4
XP13TND	inciples of cooling. Equipments for achievement of low temperatures, liquifiing of gases. Ultralow temperatures. Properties of isotopes	Z,ZK	_
	inciples of cooling. Equipments for achievement of low temperatures, liquining of gases. Officiow temperatures. Principles of superconductivity theory, transport currents, stability of superconductivity state, weak su		
	ies and technology of metallic and high temperature superconductors. Thermal insulation of low temperature equipments. Low temperature		_
	and work in low temperature laboratory. The use of low temperature technology in practice.	7	
XP13TPD	Technological Processes in Electronic Manufacturing	Z,ZK	4
	nology of packaging. Contemporary methods of packaging of components SOP, DIP, SIP, ZIP, QFP and others, properties, advantages,	,disadvantages.	Comparison
of packages from the	e viewpoint of environmental resistivity. Classification of multichip modules. Multichip modules of different types: MCM-L, MCM-C, MC	M-D, PMCM. S	ubstrates for
multichip modules. 7	Technology of contacting og dies. Electrical design of MCMs. Thermal design of MCMs. Physical design of MCMs. Parameters for evaluations of MCMs. Parameters for evaluations of MCMs.	luation of MCM	s. Reliability
	of MCMs. Design tools. Programmable modules. Applications of MCMs.		
XP13VNM	Research of new materials	Z,ZK	4
	r the topics of materials such as Piezoelectrics, pyroelectrics and ferroelectrics without lead, Multiferroics, Special magnetic elements, C		
	nspired materials and hybrid organic inorganic materials, Polymers and composites containing polymer for electrical engineering, Nar		-
alloys) with controll	led content of amorphous / crystalline / nanocrystalline mass, Metals with extreme dependence of electrical resistance on temperatur		
influence on motori	ial habarias Carbidas and nitridas (MAX phass). Critical matheda for atudu of these materials will be discussed. Characterization of		
	ial behavior, Carbides and nitrides (MAX phase). Critical methods for study of these materials will be discussed - Characterization of regions. Characterization of materials by microscopy (SEM TEM polarized light, confocal). Characterization of materials by impedance	materials by diff	raction and
	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance	materials by diff	raction and
spectroscopic techr	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedanc simulation of temperature and el. fields.	materials by diff ce analyzers, Mo	raction and odeling and
spectroscopic techr	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics	materials by diff ce analyzers, Mo	raction and odeling and
xP13VTK Physics of gas. Volum	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics ninous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles	materials by diff te analyzers, Mo Z,ZK of cooling and o	raction and odeling and 4 constructions
XP13VTK Physics of gas. Volum of real equipments	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics	materials by diffice analyzers, Mozer Z,ZK of cooling and one used in cryons	raction and odeling and 4 constructions genics.Low
XP13VTK Physics of gas. Volum of real equipments temperature therm	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics minous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating system cometry. Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum techniques.	Z,ZK of cooling and on sused in cryo- chology and cooling and on the cooling and cooling a	raction and odeling and 4 constructions genics.Low
XP13VTK Physics of gas. Volum of real equipments temperature therm XP13VVM	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics minous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating system cometry. Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum techniques.	Z,ZK of cooling and cooling used in cryo- concloder and cooling	raction and odeling and deling and deling and deconstructions genics. Low ryogenics.
XP13VTK Physics of gas. Volum of real equipments temperature therm XP13VVM	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics ninous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating system nometry. Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum temperatures. Development and Research of Materials	Z,ZK of cooling and cooling used in cryo- concloder and cooling	raction and odeling and deling and deling and deconstructions genics. Low ryogenics.
XP13VTK Physics of gas. Volum of real equipments temperature therm XP13VVM	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics ninous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating system mometry. Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum temperatures. Development and Research of Materials posite materials wth specific electrical properties. Diagnostics of materials in electrotechnology. Polymers. Phase transitions. Thin and	Z,ZK of cooling and cooling used in cryo- concloder and cooling	raction and odeling and deling and deling and deconstructions genics. Low ryogenics.
XP13VTK Physics of gas. Volum of real equipments temperature therm XP13VVM Research of comp	niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics ninous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating system cometry. Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum temperatures. Development and Research of Materials posite materials wth specific electrical properties. Diagnostics of materials in electrotechnology. Polymers. Phase transitions. Thin and polymers. Organic solar cells. Models of function of biomaterials.	Z,ZK of cooling and of ns used in cryos schnology and of Z,ZK thick conductive	4 constructions genics. Low ryogenics. 4 e layers on
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XP13VTK Physics of gas. Volum of real equipments temperature therm XP13VVM Research of comp XP14APD New trends in develor switched circuit. S XP14APR XP14DES Electric machines pleto provide the studer or FEM will be develor machines for elector for collector machines. XP14BCD Interference source Current and voltage XP14EMC Interference source Current and voltage XP14MEN The aim of the study their PhD thesis. Con in the use of new print	iniques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics minous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating system cometry. Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum te Development and Research of Materials Development and Research of Materials Development and Research of Materials New Trends in Electric Device Applications Opment and design of electric apparatus. Electric apparatus and electric devices co-operation. Electric apparatus switching characteric switching overvoltage and possibility of its limitation. Up to date systems for overvoltage limitation. Problems of high voltage motor swith measuring and testing up to date methods. Internal smart installations. New generation of building installations. New Trends in Electric Device Apply Dynamics of Electric Machines lay an important role in a number of areas, such as e-mobility, renewable energy sources utilization, robotics and automation. The man ts with deep understanding of the principles, operation, and analysis of rotating electric machiners, hermanent magnet synchrolectrical machine theory on such a level is necessary, for instance, for design of modern control methods of electric drives or construction machines general theory. Mathematical model shased on to ped for various types of electric machines (induction machines, electrically excited synchronous machines, permanent magnet synchrole. Electro-dynamic transient phenomena in electric machines, spermanent magnet synchrole. Electro-dynamic transient phenomena in electric machines. Short-circuit. Switching of the motor on the network. Electromagnetic to Synchr	materials by differentials by differenti	raction and odeling odeling an
XP13VTK Physics of gas. Volum of real equipments temperature therm XP13VVM Research of comp XP14APD New trends in develor switched circuit. S XP14APR XP14DES Electric machines pleto provide the studer or FEM will be develor enderstanding of expension of collector machin XP14DSD Assumptions for elector collector machine XP14ECD Interference source Current and voltage XP14EMC Interference source Current and voltage XP14MEN The aim of the study their PhD thesis. Con in the use of new prinusing increasingly possible control of the study their phD thesis. Con in the use of new prinusing increasingly possible control of the study their phD thesis. Con in the use of new prinusing increasingly possible control of the study their phD thesis. Con in the use of new prinusing increasingly possible control of the study their phD thesis. Con in the use of new prinusing increasingly possible control of the study their phD thesis.	iniques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields. Vacuum technology and cryogenics minous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating system to processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principles for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating system to more try. Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum techniques. Processes and the other knowledges in vacuum techniques and processes. Development and Research of Materials New Trends in Electric Device Applications opment and design of electric apparatus. Electric apparatus and electric devices co-operation. Electric apparatus switching character switching overvoltage and possibility of its limitation. Up to date systems for overvoltage limitation. Problems of high voltage motor swit measuring and testing up to date methods. Internal smart installations. New generation of building installations. New Trends in Electric Device Apply Dynamics of Electric Machines lay an important role in a number of areas, such as e-mobility, renewable energy sources utilization, robotics and automation. The mants with deep understanding of the principles, operation, and analysis of rotating electric machinery. Mathematical models based on toped for various types of electric machines (induction machines, electrically excited synchronous machines, permanent magnet synchroled electric appliances. Interference synchronous motor oscillation. Circle diagram methods for transient effect solves. Non-symmetrical short-circuits. Electro-dynamic transien	materials by differentials by differenti	raction and odeling odeling and odeling odeling and odeling odeling and odeling and odeling odeling and odeling and odeling odeling and od

XP14MID Microprocessor Control of Electric Drives 7K Control computers, their architecture. ADC, DAC special circuits, DMA, measurement of pulse parameters. Event memories, FIFOs, CAMs, multiport RAMs, gate arrays. Serial communication. DSP processor concept, fast computing, interface issues. Parallel information processing. Multiprocessor systems. Real-time system, SW, HW design techniques. Polled loops, phase/state driven systems, F/B systems. Interrupt driven system, full featured kernels. Tasks, intertask communication, queues, semaphores. Control algorithms design and issues. SW. HW design examples. XP14MIP Microprocessor Control of Electric Drives The aim of the course is to introduce students to the latest issues of mikroprocessor application in control and regulation of electric drives. The course deals with topics of control computer, digital signal processor (DSP) architecture, computational resources, fixed point, fraction, floating point arithmetic, interrupt system, DMA controller, special blocks, ADC, event memory, FIFO, CAM, Multiport RAM, impulse signal generation, serial communication, methods, buses, protocols, synchronization, multiprocessor systems, parallel processing, RT systems, preemptive RTOS, tasks, queues, semaphors, critical section, control computer programming methods, control computer resources application in scalar and vector control of electric drives XP14MIR Microprocessor Control of Electric Drives ZK 3 Control computer, digital signal processor (DSP), digital signal microcontroller (DSC), architecture, computational resources, fixed point, fraction, floating point arithmetic, interrupt system, DMA controller, special blocks, ADC, event memory, FIFO, CAM, Multiport RAM, impulse signal generation, serial communication, methods, buses, protocols, synchronization, multiprocessor systems, parallel processing, RT systems, solution methods, systems: INT, BG-FG, FSA, CC, preemptive RTOS, tasks, queues, semaphors, critical section, control computer programming methods, control computer resources application in scalar and vector control of electric drives. XP14MPD Advanced Control Methods of Electric Drives Development trends in electric drive control. Application of microprocessor technology, program realization of algorithms for modern drives, modulators, realization of direct and indirect induction machine torque control, converter with harmonic current control for synchronous machine, functions and control of compatible rectifier, preview of modern controllers for electric drives. XP14MPO Advanced Controlled Drives ZK 4 XP14MRP Advanced Controlled Drives ZK 3 XP14MTD New Trends in Converter Technology ZK 4 Up to date power semi-conductor devices. Pulse Width Modulation methods for current and voltage control. Single-phase PWM converter. Converters with unity power factor. Single-phase converter with active current shape control. Three-phase converter with active current shape control. Converter with active voltage shape control. Converters for multisystem locomotives. Resonant converters. XP14MZR New Control Methods for Electric Drives The aim of the course is to introduce students to the latest issues of control and regulation of electric drives, taking into account the focus of their doctoral work. Its purpose is to optimize electromechanical energy conversion parameters in electric drive systems and relevant power electronics, in particular by using modern control and regulation algorithms. The course is mainly focused on electric AC drives, especially drives with asynchronous and synchronous motors. XP14NAP 7K New Trends in Electric Device Apply 4 XP14NTP ZK 4 New Trends in Electric Device Theory XP14RPD **Advanced Controlled Drives** 7K 3 AC motor with variable frequency feeding. Current source converter. Voltage source converter, PWM, Electromagnetic torque by feeding from frequency converters. Vector oriented control system, Direct and indirect torque control system, Self-controlled synchronous motor drive. Methods for rotor position determination. Switch Reluctance Motor, SD motor. XP14TPD New Trends in Electric Device Theory Switching arc latter models and theory. Switching arc physics. Interaction between switching breaker and electric circuit. New knowledge in electric arc extinguishment. Influence of extinguishing medium on physical process in arcing chamber. Switcher braking capacity and possibility of their inducement. Fuses theory. Electric circuit braking with short current limitation. Electric contact theory. XP14TPR New Trends in Electric Device Theory ZK 3 XP15DVN Diagnostics of HV and EHV Insulating Systems 7.7K 4 Failure rate of operation, fault sources and mechanisms. Indoor and outdoor insulation of electrical equipment. Diagnostic methods, using in operation. Choice of methods for diagnostic systems. Application of database systems for electrical machines and equipment of HV and EHV. Application of systems with element of artificial intelligence in electro diagnostics. **Energy Economy** Energy economy, part of national economy. Terminology of energy economy. The energy systems. Forecast of energy consumption. Energy balance in production field, Energy balance in buildings. Energy economy and its impact to environment. Energy economy on the organization level. The control of energy economy. Basic problems of energy policy XP15ES **Electrical Lighting** Visual sensory processes. Light micro climate design. Daylight, artificial and mixed lighting. Visual performance. Visual comfort. Colorimetry. Light sources. Luminaire characteristics Lighting systems. Exterior and interior lighting. Lumen method. Integrated and remote controlled lighting systems. Electroheat The definition of fundamental equations of heat and mass transfer in electromagnetic field in continuum. Thermal effects of electromagnetic field. The definition of the problems of induction, dielectric and arc heating. Similarity and analogy of equations and their use. Numerical methods in electroheat. XP15EXE Expert Systems in Electrical Power Engineering 4 Data processing and evaluation. Expert systems in electrical power engineering and diagnostics of insulating systems. Application of rule-based expert systems and neural networks in electrical power engineering and diagnostics of insulating systems. Creation of expert systems for electrical power engineering and electro diagnostics. Control in Power Engineering Overview of enviromental problems. The role of power engineering. Global climate change. The greenhouse effect. Carbon dioxide emissions. Impact of nuclear power plants. Impact of hydro power plants. Renewable energy sources. Methods and technology for decreasing of impact to environment. Electric power transmission and the environment. The control of power energy system XP15FAK Photometry and Colorimetry Z.ZK Principle of photometric methods. Standards of luminance and luminous flux. Receivers of radiation and modification of their characteristics. Photometric distance. Measurement of light source parameters. Luminaire parameters. Measuring of indoor lighting systems. Measuring of outdoor luminance and illuminance. Colour vision theory. Chromaticity. Colour. Colorimeter space. Colour rendering-index. Chromaticity system. Diagram of chromatic. Colorimeter. Spectroscop XP15MPE Mechatronics in Electrical Power Engineering Z,ZK Basic model modules, models and control systems of steam generators, steam and water turbines and nuclear reactor. Dynamics and control of STATCOM and power factor compensatores. High Voltage Measurement Types of testing voltages and high voltage generators. Measurement cables, attenuators. Disturbances of HV measurement. Measurement of impulse voltages by voltage dividers, types of dividers. Dividers for measurement of fast transients, calibration of dividers. Measurement of DC high voltages, HV resistors and dividers. Measurement of AC high voltages, instruments for measurement of RMS voltages. Instruments for measurement of voltage peak values. Measurement of high current, shunt reactors, Rogowski coil. Measurement of current on potential by utilization of optical-fibre waveguides. Voltage tests of transformers. HV measurement of dielectrics.

XP15PEE Transmission of Electricity Z,ZK Types of networks and transmission systems. Multiple overhead lines. Symmetrical components. Calculation of load flow. Analysis of faulted power systems, different types of shunt and series faults and simultaneous faults. Special transients in the integrated power systems. Distance and comparison protection relays, principles and applications, EMC and interferences in power networks, prediction and limitation of disturbances due to non-linear loads. Static stability of the power system and its criteria. Dynamic stability of the power system and its criteria. Methods for increasing of the stability in power systems. Multimachine transient stability. Reliability of the power transmission systems. Control of Power Systems XP15RE Objective functions of power system control, feasibility and algorithms of optimization methods, handling of constrain conditions. Hierarchy and decomposition of system controlling tasks. System state estimation. Load forecasting and load curve civering. Unit commitment. Optimization of operation with respect to net topology constrains. Control of voltage and reactive powers balance. Control of frequency and active powers balance. Optimal power flow. Dynamical models of power stations and systems. Solution of extraordinary states.. Dispatch, system and subsidiary services. XP15SPS Coupled Problems in Heavy Current and Power Engineering Concept of a coupled problem, classification of the coupled problems typical for heavy cur-rent and power applications. Mathematical description of the relevant physical fields, links between corresponding partial differential equations. Characteristics of electromagnetic-thermal problems (with respecting eventual thermoelasticity), electromagnetic-thermal-hydrodynamic and electromagnetic-mechanical problems and also problems based on a com-bination of the electromagnetic field and electric circuits. Formulation of their mathematical and computer models and algorithms of their solution. Information about available SW, its existing capabilities and perspectives. XP15TOS Theory of Light field Z,ZK Theory of light field. Mathematical description of emission of unsymmetrical luminaires. Photometry of distante and close point. New characteristics of space properties of illumination. Flux method calculation of integral characteristics. Light field of surface type and cube type luminaire. Light flux distribution from point source. Distribution of light flux of linear source. Distribution of light flux of surface source. Interreflection theory. Design of indoor illumination using PC. XP15UEE Z,ZK Electric Energy Use and Conservation 4 Research Methods in th Use of Electrical Energy XP15VME Z,ZK 4 Introduction into the mathematics of continuum physics. Physical conservation laws. The laws of electromagnetic field. Similarity theory in thermo-aerodynamics. Similarity theory in electromagnetic field. Mathematical modeling. Analytical solutions of electromagnetic field. Discrete parameters and their relation with field parameters. Numerical access to deterministic mathematical modeling of fields. Non-deterministic modeling. Experiment and data processing, practical examples. XP15ZSS Z,ZK Light sources and Equipment XP16AFM Advanced Financial Management Methods ZK 4 The aim of the course is a deeper understanding of the more complex financial management issues. It builds on knowledge of standard financial management courses. The main topics are alternative capital market models, other investment valuation methods (generalized NPV method, general IRR method). The student will learn how to protect against risk using derivatives, evaluating exotic derivatives. In addition, students will assess using the Monte Carlo method the value of derivatives and financial instruments for which the so-called closed formulas are not available. Other modern finance issues will be addressed through case studies. An integral part is the question of numerical methods, their reliability and their practical use. Students create their own models and simulations based on the chosen topic. The output will be a comparative analysis of the proposed methods and standard methods. The wide use of computational tools and models (Matlab, Mathematica, others) is assumed. XP16DEL ZK 2 History of technology and economic XP16ECM1 Quantitative research methods in economy 1 This course is a direct sequel to Statistics/Linear regression. The objective of the course is to expose the student to variety of common and practical econometric challenges with the ultimate goal of gaining a stronger appreciation of strengths and weaknesses of econometric methodology and to overview historical developments in applied econometrics. The course assumes familiarity with the general linear model and knowledge how to deal with basic model and data deficiencies, simultaneous systems, and simple time-series processes. The course will start developing theoretical topics covered in the essential courses on Econometrics. The course will follow with different empirical research projects drawn from the literature. Each project will be introduced by the relevant economic theory-model. Using own and empirical data sets, the students will apply standard econometrics methods to answer basic economic questions. Exercise sessions will provide introduction into advance use of statistical packages (best is TSP or Stata or their derivatives like E-views) and a feedback on possible solutions of problem sets. The course will require intensive work with data and statistical packages. Quantitative research methods in economy 2 This course should be a sequel to the basic Econometrics (Basic statistical methods and Linear regression model). It assumes familiarity with the general linear model and knowledge how to deal with basic model and data deficiencies, simultaneous systems, and simple time-series processes. Advanced Econometrics is the next course in a seguence (MA course(s) in Statistics and on Regression) designed to introduce tools necessary to understand and implement empirical studies in (micro)economics. The main emphasis of the course is twofold: (i) to extend regression models in the context of cross section and panel data analysis, (ii) to focus on situations where linear regression models are not appropriate and to study alternative methods. The objective of the course is to expose the student to variety of basic applied microeconomic challenges with the ultimate goal of gaining a stronger appreciation of strengths and weaknesses of the econometric methodology. Examples from applied work will be used to illustrate the discussed methods. Selected topics from advanced econometrics will be covered as well. XP16EES Economics of energy systems ZK The aim of the course is to acquaint students with the emerging issues and problems associated with decentralization and liberalization of energy markets. These are two main groups of issues: how to address economic issues within interconnected markets and how to address economic issues within a decentralized market. In the course, students will learn how to connect technical calculations with the determination of economic variables - especially prices. Key issues are supply zones, transit payments, loss-sharing, re-dispatch. It is also about dividing costs between customers, setting tariffs for electricity, dividing effects from decentralized production and more. Within the subject, the students will replicate the calculations and procedures that are currently delivered within the interconnected electricity system. The aim is to analyze and identify the strengths and weaknesses of these processes. XP16EKO Economics ZK Basic economic terms. Principles of microeconomics, consumer behaviour and producer behaviour. Profit maximization. Perfectly competitive market. Market failure, monopoly. Principles of macroeconomics, aggregate demand and aggregate supply. Labour market. Money market and capital market. Macroeconomic policy of the government as a factor protecting and correcting the market. Comment: The subject is a necessary precondition for understanding other economic and managerial disciplines **Economics and Management of Energetics** Organizational structure of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and tariffs of energy. Governmental energy policy. Development of international cooperation in power industry and its economic and ecology aspects. XP16EPM Economics of power markets 7K The subject provides basic theoretical knowledge about the organization and functioning of electricity markets. The starting point is the theory of short- and long-term marginal costs and the generation of the electricity supply curve. This is followed by the theory of integration of electricity markets and the creation of economic welfare (social welfare). Current trends in power generation tend to decarbonise and integrate electricity markets. This, together with the massive rise in electricity from intermittent sources, leads to the need for a new constitution of electricity markets and new business models including demand response and the development of the prosumers concept (where end consumers of electricity are also electricity generators). Part of the subject is also discussion of other links of the electricity market - emission allowances, connection to the heat market and other commodity markets. XP16ERE Economics of power generation from RES ZK The subject focuses on complex problems of economy of production of electricity and heat from renewable energy sources. The course develops the acquired knowledge in the field of financial management due to the specifics of electricity / heat generation from RES and the expected development of energy markets. Consequently, it deals with the theoretical concepts of the electricity market, taking into account current trends in the decentralization of energy systems, decarbonisation of energy and the expected high penetration of electricity

from RES into the e	electricity market. These trends require the development of different types of energy accumulation and the implementation of smart tec of network operation. The course also includes modeling of the development of energy systems with high RES share.	chnologies in the m	nanagement
XP16ERU	Accounting	ZK	4
	inting. International accounting standards (IFRS). Methodology of accounting. Cost, revenues, profit and cash flow. Balance sheet, pro		ınt. Analysis
	of company's financial position.		•
XP16FIM	Financial Management	ZK	4
Principles of financ	re, present value and alternative cost of capital, net present value, present value of bonds and stocks, investment decision making and	net present value	, return and
alternative cost of	capital, risk and return, lease or buy decision, inflation and return, real options, financial options, option valuation, hedging, short teri	m finance, cash flo	w finance.
XP16FVT	Philosophical Problems of Science and Technology	ZK	2
_	aged in the evolution of principal ideas on which the science and technology are founded. Philosophical aspects of physics and mathe		r examined.
	Actual themes linked to the so called "Postmodernism" and to the alternative ways of understanding and their social coherences are		1
XP16HDS	History of Transport Systems and Communications	ZK	2
XP16HEL	History of Electrical Engineering	NIC	2
XP16HIS	Historiography of the Development of Science, Technology and the Methodology	ZK	4
XP16HKA	Historical structures and technologies in architecture	NIC	2
XP16HKC	Science, Technics and Technology in the Historic Landscape of the Czech Lands	ZK	4
XP16HPH	History of Physic	ZK	4
XP16JAK	Quality Management	ZK	4
	in the organization. Statistical methods in quality management. Models of quality systems. Economic issues in quality assurance. Imp	olementation of re	quirements
	of ISO 9001 standard. Certification of products and production systems. Recommendations for quality management in the organi	zation.	
XP16KVM	Quantitative Research Methods in Management	ZK	4
Application of soft	ware SPSS for advanced statistical methods as multiple regression and correlation, analysis of variance, factor analysis, cluster analy	rsis and its using i	n marketing
	research and management.		
XP16MAN	Management	ZK	4
	f management and its innovation, modern ways of management, responsibility of managers, manager's ethics, successful manager t		riour.
XP16MAR	Marketing	ZK	4
The role and function	ons of the marketing management. Marketing research and marketing information system. Concepts of marketing strategy. The use of	product life cycle a	ınd portfolio.
	Product and service policy, pricing and contractation policy, communication, distribution. Marketing mix.		1
XP16MAS	Marketing Strategies	ZK	4
Broadening of ba	sic knowledge of marketing. The analysis of marketing strategies in different market situations. The firm's behavior under competition	and competitive a	idvantage.
VD4CMALL	Case studies in the field of product policy, price and condition policy, communication policy and distribution policy.	71/	4
XP16MAU	Accounting for management anagerial accounting. Relations to the organisational structure of the enterprise and to the production process. Budgets, use for mana	ZK	4
The principles of th	analyses. Productivity and measurement of productivity in the production process. The managerial information systems.	gement. Calculation	nis and cost
XP16MAV	Production Management	ZK	1
	tion process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning with re-		on typology.
	Standardized basis of production management, standardization. Controlling, production management methods.) [3).
XP16MES	Economics and Management of Energy Systems	ZK	4
	of electric power sector, gas systems and central heating systems functions. Marginal revenue in electric power system. Marginal co		eat and gas.
Power elements or	otimization, subsystem and system optimization in generation and transportation of different kinds of energy. Reliability in energy deliv	ery. International	cooperation
	in power industry. Energy price regulation and its consequences		
XP16MEU	Economics and Management of Energetics	ZK	4
Organizational stru	icture of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and tariffs of	energy. Governme	ental energy
	policy. Development of international cooperation in power industry and its economic and ecology aspects.		1
XP16MVE	Selected Problems of Economy and Management of Energy	ZK	4
The role of product	tion process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning with respect to the firm and the competitive advantage.	espect to producti	on typology.
VD400DE	Standardized basis of production management, standardization. Controlling, production management methods.	NIIO	
XP16SDE	Building heritage of the industrial era	NIC	2
XP16STM	Selected Statistical Methods	ZK	4
Descriptive statistic	cs. Transformation of random variables. Aproximation of theoretical distributions. Interval estimates. Hypothesis testing. Simple and multip	ie regression. Ana	llysis of time
VD46CT\/	series.Index number.	71/	4
XP16STV	Product Strategy rvice policy, pricing and contractation policy, communication, distribution. Marketing mix. Inovations. Concepts of marketing strategy. R	ZK	Product
i roduct and ser	management. The strategic marketing simulation Markstrat.	teverse marketing	. i iouuci
XP16VPB	Science, Technology and Industrial Boom	ZK	4
XP16VTK	Everyday Science and Technology	ZK	4
XP16VTK XP16VTS			
	Development of Technical Universities	ZK	4
XP16ZVP	Fundamentals of Scientific Work	ZK	4
XP17ANS	Selected Chapters from Antennas and Propagation nas and modern antenna technology. Selected problems of antennas and propagation for fixed and mobile communication, earth and	ZK	Frequency
=	nas and modern antenna technology. Selected problems of antennas and propagation for fixed and mobile communication, earth and different services and communication. Topics of near a far field antenna measurement, compact antenna measurement. Measureme		
managoment loi	services and communication. Topics of flear a fair field affering fleasurement, compact affering fleasurement. Measurement services. Antenna anechoic chambers design.	or orginal level it	. opouniu
XP17APL	Applied Optoelectronics in Medicine	ZK	4
	s of non-invasive measurement techniques in medical diagnostics. Fundamental physiology of the vascular system, hemodynamics, si		ı
<u>-</u>	on of the cardiovascular system. UV, VIS and IR spectroscopy. Fundamental optics of the eye and color analysis. Optical parameters of		
	of light, Design of optical sensors, Optical visualisation principles of translumiscetion and tomography, Optoelectronic systems in m	-	
XP17ELD	Electrodynamics	ZK	4
•	·		

XP17LAE	Medical Applications of Electromagnetic Field	ZK	4
•	es of EM Field medical applications. Principals and technical equipment for EM thermotherapy, hyperthermia applicators. Calculation		•
distribution. Deta	ails of microwave thermotherapy apparatus are given, especially from the point of view of applicators for local, intracavitary and region thermometry (NMR, ultrasound and radiometry) and special compatible applicators are described.	nai treatment. Non	-invasive
XP17MAPP	Analysis Methods for Passive Elements of Microwave and Millimeter-wave Technique	ZK	4
	nsmission lines parameters. Computation of microwave circuits scattering parameters, analysis of planar antennas. Survey of basic m		
	stress on methods: spectral domain, integration equation, finite differences, finite elements, mode matching, transversal resonance. S		
	electromagnetic fields, moment method, disturbance method.		
XP17MT	Microwave Technique	ZK	4
	ission lines and its circuit elements including hybrid and monolithic integrated circuits technology. Resonators and other type of passi		1
attenuators, coup	elers, isolators and circulators, modulators etc.) and active microwave circuits (e.g. oscillators, mixers and amplifiers), microwave filters. CAD of microwave circuits.	s, microwave meas	surement.
XP17MVP	Methodology of Science	ZK	
XP17NME	Numerical Methods in Electromagnetic Field	ZK	4
	noholtz and wave equations. Analytical, semianalytical, seminumerical and numerical methods. Matrix equations and algorithms: Mod		•
Matching Method, N	Method of Moments, Multiple MultiPoles, Boundary Element Method, Finite Difference Method, Finite Element Method, Finite Integration	on Method. Stability	of solution.
	of matrix equations: direct methods, Gauss-JordanOs elimination, pivotation, LU-decomposition, banded and sparse matrix, conjuga	te-gradient method	
XP17OV	Optical Fibers	ZK	4
Waveguiding in or	ptical fibers, attenuation and dispersion, step-index fibers, gradient fibers, single and f1ibers, optical cables, splices and connectors, of the control of	optical fibers meas	urements,
XP17PEM	fabrication, nonlinear phenomena in optical, fibers, fibers for sensors. Advanced Electromagnetism	ZK	3
	ts advanced topics of classical electromagnetic field theory, especially: electric and magnetic vector potential; reciprocity, duality, and		
•	expansion; scattering and characteristic modes; homogenization and Bloch's theorem; synthesis and topological optimization The known is a second of the seco		
	can be used in many branches of applied electromagnetism, especially in antenna theory and microwave circuit design.		
XP17TAM	Evaluation of Applicators for Microwave Thermotherapy	ZK	4
	sed on methodology of evaluation of microwave applicators, which means measurements of SAR distribution in water phantom and n		
	ous types of agar phantoms. Further design and optimisation of measuring probes is discussed, methodology of probes calibration at		evaluation
XP17TOM	escribed. Numerical modelling of microwave applicators by aid of software product FEMLAB, comparison of mathematical and exper Theoretical Optoelectronics in Medicine	ZK	5
	o doctoral students from different disciplines the opportunity of both highly theoretical studies and numerical simulations of interaction		
_	he spectrum (and adjacent UV and IR bands) with biological tissues. And to learn about modern optoelectronic sensor concepts and to	-	
medical therapy a	nd diagnostics. Interdisciplinary topics will be discussed and focused on the benefits and current applications of optoelectronics in mo	edicine. Important	definitions
	n intensity, etc.) will be formulated and important methods will be described, in particular: radiometry, photometry, eye as a radiation of		
	erometry, scattering measurements, integration of spherical theory, etc. Emphasis will be placed on modern theoretical approaches (ulation of the light intensity distribution in biological tissue, theory of radiation transmission (e.g. theory and model Kubelka-Munk), etc		
	s of numerical simulations of the given problems by aid of modern SW products (like e.g. COMSOL Multiphysics, SEMCAD / Sim4Life		- 1
· ·	I methods FDTD, FEM, MoM, Monte-Carlo etc. Operating principle of the optoelectronic reflective and transmissive sensors. Measured	•	- 1
	eral blood volume dynamics, clinical examples and typical examination tests. Principles and applications of functional optical imaging		al biopsy, IR
	anoscopy, IR thermography, Laser Doppler perfusion imaging (LDPI), Photoplethysmo-graphy imaging (PPGI), optical coherence ton		
XP17TVC	Technique of Highly Sensitive Receivers	ZK	4
	r sensitive microwave receivers, mm - wave and submm - wave receivers. Electromagnetic spectrum and noise properties of the Eartl The wave communication. Semiconductors for microwave and millimetre wave bands, SIS detectors, mixers, infrared receivers. High frequ	•	
	surement of noise parameters. Multispectral radiometry and remote sensing, electromagnetic radiation - interference, EMC theory and	=	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
XP31AEO	Electric Circuit Analysis	ZK	4
Circuit models of	devices and structures. Methods of analysis and algorithms for linearized circuit models in time domain and frequency domain. Transi	ient analysis. Perio	dic steady
state analysis. A	nalysis of nonlinear circuits in time and frequency domains. Parametric models. Circuits with non-linear energy storing elements. Circ	cuit analysis with th	e help of
VD24ADT	professional software packages.	71/	4
XP31ART	Architectures for Real Time Implementation ntral processing units and synthesis of data paths for DSP. Implementation strategies of DSP algorithms. Influence of algorithm modif	ZK	4 ementation
	equential and parallel processing. Numerical characteristics of algorithms. Implementation alternatives, dedicated hardware and proc	•	
Architectures of dig	ital signal processors with fixed point and floating points. Developments tools for real time processing. Analysis of real time implement	tation of FFT, digital	al filters and
	special algorithms for communications.		
XP31ASN	Algorithms and Structures of Neurocomputers	ZK	4
	the basic principles and possibility of the application of the neural informative technology for the signal processing are the main topic		
	o the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural netw ssing are investigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSO		it the signal
XP31CZS	Digital signal processing	ZK	4
XP31DIF	Digital filter synthesis	ZK	4
	gital signals. Impulse response, step response, convolution. Elements of z-transform and Fourier transform. Difference equation, transf		-
-	esign methods for finite impulse response (FIR) digital filters - windowing and frequency sampling methods, optimal design algorithms	-	
half-band and narro	ow-band filters. Design methods for infinite impulse response (IIR) digital filters. Bilinear transformation. Analytic design methods in digital filters.	tal z-domain. All-pa	ass sections
VD04D0D	as building blocks for signal processing. Group delay equalization, phase shift and notch filters. Wave digital filters.	71/	
XP31DSP	Digital signal processing on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the per	ZK	4 dies in the
	s on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the nec processing. It covers spectral and cepstral analysis, parametric methods, optimal LTI filters, frequency analysis, methods of analysis of		
XP31FON	Speech Phonetics and Advanced Voice Technologies	ZK	4
XP31FSK	Phonetic signals and their coding	ZK	4
	uces the processing of speech signals. Within the subject students should manage from basic to advanced and modern algorithms o		-
_	nent. Further reasonable part is focused on speech recognition, where students will get to know modern and advanced technique in task	_	
speech recogniti	on or speaker recognition. Special attention is devoted to usage of classification techniques based on GMM, DTW, HMM, ANN/DNN,	WFST, JFA, i-vect	rors, etc.

XP31NOS	Design and circuit structures of electronic systems	ZK	4
	vith important applications of analogue technique. The subject is divided into the three basic parts. The first part is devoted to amplifier	s and analog funct	ional blocks
for measurement	and signal processing. Special application amplifiers, nonlinear and parametric analog functional blocks and fast analog circuits opera	ting in current mod	de are also
discussed. The se	econd part is devoted to linear analog systems, their characteristics, description and synthesis capabilities. There are discussed: the ty	pes of filters and t	heir field of
application, me	thods of filter synthesis and their optimization with regard to real properties and value variances of the circuit elements, implementatic	n of active filters, i	ncluding
discrete-time filter	rs, i.e. switched capacitor (SC) and switched-current (SI) circuits. The last part deals with computer-aided circuit design. The principles	of modeling of the	e analyzed
system, including	g models of functional blocks and circuit elements are discussed together with simulation result processing and their utilization for circ	uit design and opt	imization.
XP31TSS	Signal and system theory	ZK	4
	isformations - Laplace and Z-transforms, Fourier transform, cepstra, wavelet transforms. Signal parameterization - AR, MA, ARMA mo		
3	classification - spectral distances, Markov models, neural nets, signal prediction.	,	3 3
XP31ZBS	Biological Signal Processing	ZK	4
	with the processing of biosignals and advanced methods of processing resulting from current research in solving common projects in co		
	cal faculties, institutes of the ASCR, foreign universities). The subject concept allows us to respond flexibly to new directions and know		, institutions
•			4
XP32AKR	Applied Cryptography	ZK	4
	ryptography. Mathematics Foundations of Cryptography. Related Problems of Number Theory. Public Key Parameters. Pseudorandom E	•	
Ciphers. Block Ciph	ners.Public Key Enciphering. Hash Functions and Data Integrity. Entity Identification and Autentication.Digital Signatures. Key Manageme	ent Protocols.Key IV	lanagement
	Techniques.Effective Implementations of Supporting Algorithms. Patent Pendings and Standards.		
XP32DKS	Sizing of communications networks	ZK	4
XP32DZS	Digital Signal Procesing in Telecommunications	ZK	4
XP32MOS	Mobile Networks	ZK	4
	rizes students with evolution and standardization of mobile networks and mainly provides a detailed description of network architectures		· ·
	used in mobile networks. The course as well depicts trends and the future development of mobile networks.		
XP32NMR	Numerical Methodes of Electromagnetic Tasks Solution	ZK	4
	, ,		· -
-	with analysis of electromagnetic field distribution through both air and other environment. It offers a view deep inside to popular numerical		
Metriod, Bouridary	Element Method and Finite Element Method. Handling the software is obvious nowadays; nevertheless, the mayor attention is paid to un	•	amemancai
\/D===0D\/	background of the used apparatus and understanding the physical principles of the solved tasks in symbiosis to particular used so		
XP32ODV	Intellectual property protection	ZK	4
=	uces the basic issues of intellectual property (IP) protection. Students learn why it is necessary to protect research results, how they continue the same of intellectual property (IP) protection. Students learn why it is necessary to protect research results, how they continue the same of intellectual property (IP) protection.	-	
	signs, how to obtain a trademark and also how to succeed with IP protection at the international level. The course also deals with lice		
	tion methods as part of a standard way of commercializing original IP. Emphasis is put on quality methodology for database searching		uccessful
	earch and development projects. Motto: Those who do not protect the results of their research work can never dream of being on par		
XP32OSY	Optical Systems	ZK	4
Optical transmiss	ion systems are being more extensively used in a practice, particularly in a telecommunication networks. Tremendous transmission ca	pacity and small s	ize offered
by a fiber are just t	wo key factors making it attractive. The objective of this subject is to provide students with a more rigorous theoretical background of fi	ber and transmiss	ion systems
	function.		
XP32RTS	Telecommunications Systems Management	ZK	4
Telecommunication	ns Systems Management is a discipline which deals problems of interactions of technical and business aspects of management of tele	ecommunication ne	etworks and
	services provided.		
XP32TPZ	Teletraffic Theory	ZK	4
	rse is to present an overlook of dimensioning of telecommunications networks on the basis of results of the queuing theory (QT). Introd		-
	networks both from the point of view of grade of service GoS and quality of service QoS as well. Results of the QT are applied on diffe		
_	networks deploying and operating at time being. Theoretical knowledge about models of service systems can be utilized for dimensioni	=	
tolocommunication	in real life - not only in the telecommunication.	ing of different serv	icc systems
VD22DID		ZK	4
XP33BID	Bionics		-
-	logy + technology = bionics. Bionics Classification. An overview of biological principles and its technological parallels: reproduction, gr		_
_	tion, excrementation, thermoregulation, vision, hearing, taste, smell, sense of touch, speech, memory. Neural and neuronal systems. N		
	ics. Information transfer in biotechnological systems. Biosystems modelling. Biosystems diagnostics. Orientation and navigation. Func		
external substitute	s, bioprotheses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems. Intelligent input and	output filters. Sup	port system
	for creative thinking.		
XP33CHM	Chapters in higher mathematics	ZK	4
	ets of several deeper results in a few mathematical disciplines. The idea is to help a student to read, with a certain comfort, the monog		
mathematics. The	contents of the course are fundamental results (principles) of nowadays mathematics. More specifically, the course concerns the Stor	ne representation t	heorem for
Boolean algebras	s (as applied in mathematical logics and probability theory), the Banach fixed-point theorem for complete metric spaces (as applied in	numerical mathem	natics), the
Tychonoff theorem	on compact spaces (as applied in measure theory), the Riesz representation theorem for linear forms in a Hilbert space (as applied i	n the optimization	theory), the
Brower theorem fo	r balls in Rn (as applied in linear algebra the Perron theorem), the elements of category theory for a practical man, etc. The asset ma	y be a certain enco	ouragement
	in a students research.		
XP33DID	Distributed Artificial Intelligence	ZK	4
In winter semester	2023/24 the course runs for the last time. In future years, it will not be opened anymore. Distributed problem solving. Multiagent plannir	ng. Cooperation. C	oordination.
Communication.	Communication strategies, message passing. Various Al approaches, case studies. Types of agent behavior. Negotiation. Organization	nal structuring. Par	rtial global
planning. Black	board systems. Client-server systems. Peer-to-peer systems. Implementation aspects of distributed knowledge-based systems. Learn	ing in multiagent s	systems.
	Meta-agent. Agents acquitance models, social knowledge, reflectivity in MAS. Coalition formation, team work. Formal models of agent		
XP33ECD	Evolutionary Computing	ZK	4
	lutionary computing in contrast to classical computing techniques, Genetic algorithms (GA) for optimisation. The Simple Genetic Algor		
	negative phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typical tasks		
J, ·	GA and GP applications. Special methods for improving GA performance.		J.
XP33FLO	Fuzzy Logic	ZK	4
7.1 OO! LO	Basics of fuzzy sets and fuzzy logic. Measures on collections of fuzzy sets. Principles of fuzzy control.	- '`	
VD22C AD		71/	1
XP33GAD	Geometrical Algebras	ZK	4
Aigebraic Structul	res used in geometry: Groups and linear spaces, ordered groups and fields, othogonal groups, Clifford algebras, etc. Discussion of po	terititai application	s iii iiiiage
VECCICE	processing.	71/	
XP33ICT	Modern ICT for Industry and Smart Grids	ZK	4

XP33IMD	Informatics in Clinical Medicine	ZK	4
	ocessed by automatized systems. Specific problems of medical informatics. Computer supported documentation in doctor's work. Ho	-	-
-	iformation system projects from the point of view of medicine. Introduced hospital information systems. Diagnosis theory, computer aided Fir application in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in m	-	-
=	Computer aided therapy planning. Standardiyation and communication between information systems in medicine. Specialized computer		sive care.
XP33KHD	Introduction to Game Theory	ZK	4
The course offers a	brief survey on classical and contemporary theory of games. It includes the elements of the utility theory, decision-making theory, solution	on concepts of non-	-cooperative
	mes (balance and minimax) and the basic concepts of coalition games, especially its solutions (core and value) and relation to the m		•
XP33KSI	Sotware Engineering - Selected chapters	ZK	4
XP33LPD	Logic and Logic Programming	ZK	4
-	s and its relation to technical disciplines. Formal system and its essential properties - validity, completeness. Syntax and semantics, b		-
	ler language and its interpretation. Theory and its model, Herbrand´s model. Herbrand´s theorem, Gödel´s completeness theorem an ility and probability. Logic programming and Prolog language. Metodology of logic programming. Introduction of extralogical features an	· ·	-
•	straint logic programming (CLP)and inductive logic programming (ILP). Some practical examples of complex logic programs and pract	•	
XP33MAD	Mathematical Analysis of Dempster-Shafer Theory	ZK	2
•	neory (DST) presents a model for uncertainty quantification and processing in knowledge-based systems. The belief function, which is the		
	duced and investigated in this theory, can be taken as a generalization of probability measure. The model of DST will be presented. Ge		-
	ed as well as to the case when only a fragment of the outcoming knowledge demanded by the classical DST is at our disposal. Belief the an values will be also briefly mentioned. The intended goal of the course is to offer a solid basis for the practical and critical application.	_	
in particular, boole	application oriented toward decision making under uncertainty.	ins of DoT in varie	ous neius oi
XP33MKD	Mathematics for Cybernetics - Selected Topics	ZK	4
	dern mathematics. Ordering, lattices, Boolean algebras, representations. Topological spaces. Metric spaces, completeness, fixed-poin		l
fractals. Linear space	ces, constructions with linear spaces. Systems of linear equations, spectral theory. Matrix calculus, matrix inequalities. Least squares and	l singular value dec	composition.
	Tensor product. Elementary theory of Hilbert spaces. Introduction to category theory.		
XP33MMD	Analysis and visualization methods for medical data	Z,ZK	4
XP33MOL	Modal Logics for Distributed Systems	ZK	4
	edge in distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible /ledge. Correspondence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge		operties of
XP33MZT	Management of Knowledge and Information Technologies	ZK	4
	ch to the design of knowledge-based and information systems. Configuration of information systems. User interfaces, especially cogniti		l
	sis of the problem solving processes based on description of the workflows. Simplification of the processes by the support of IT (Proces		_
Engineering). Mod	dels and tools for modelling. IT applications in enterpreneurship as well as in the project management. Business Intelligence. Value ch	_	suppliers,
	manufacturers and customers. E-commerce. Role of knowledge in globalization of businesses. Virtual enterprises and organiza		
XP33NUM	Numerical Analysis	Z,ZK	4
	ces to basic numerical methods of interpolation and approximation of functions, numerical differentiation and integration, solution of tr Il equations and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demonstra	-	-
partial) amoronia	Maple and computer graphics.	alon of alon propor	i lioo doirig
XP33OSD	Real Time Operating Systems	ZK	4
Hardware support t	for operating systems, system and user modes, memory protection, operating systems (OS) classification and types, special requirem	nents of real-time a	applications.
, ,	m processes and application programs, kernel and its services, system calls. Concurrent processes and threads, inter-process communic		
	ectures. Process scheduling, scheduling in single- and multiprocessor systems. Processor management, process creation and terminatior file system functions, disk allocation strategies, device drivers. Inter-process communication (IPC), IPC based on shared memory an		
	letection, critical section, deadlocks. Synchronization tools: semaphores, monitors, looks, deadlock detection and prevention. OS kernel or		
	TCP/IP.	. ,	3,
XP33PAD	Probabilistic Algorithms	ZK	2
A survey of basic r	notions of statistic and probability. An analysis of the notion of non-deterministic algorithm. Effectivity criteria for non-deterministic algorithm.	orithms. Theoretica	l apparatus
of probabilistic algo	rithms. The probability of failure. Loss function. The expected risk. Probabilistic analysis of deterministic algorithms. Criteria for applications and the control of the	tion of probabilistic	algorithms.
\/D00D444	Probabilistic algorithms and their practical importance.	714	
XP33PAM	Industrial application of multi-agent systems	ZK	4
XP33PMD	Probabilistic Models of Uncertainty in AI bability. Foundations of graph theory. Triangulated graphs and their characteristics. Information as a measure of dependence. Conditional	ZK	4
	ependence Lemma). Knowledge representation by multidimensional distributions. Qualitative knowledge represented by dependence		
.,	models and Bayesain networks. Decomposable models for computation in Graphical Markov models. Examples of application		
XP33POS	Fundamentals of Possibilistic Measures	ZK	4
Possibilistic measu	res present a mathematical tool for uncertainty (randomness) quantification and processing applying the notions and apparatus of the	so called fuzzy se	ts. They are
	abilistic measures in the sense that they are based on the maxitivity priciple in spite to the additivity principle applied in the standard m	•	
	t that the operation of maximum (supremum) can be defined also in certain non-numerical structures, possibilistic measures taking th cular, in complete lattices, are worth being investigated. The lecture will not suppose any preliminary knowledge in fuzzy set theory, la		-
sets and, in parti	measure and probability theory.	attice theory of the	Staridard
XP33PPD	Practical Data Mining Problems	ZK	4
	sed on solving of practical data mining problems. Lectures deal with data transformation, pre-processing and verification, selection of a		ng algorithm
and data mining	process evaluation and results interpretation. The attention is paid to solving of an individual data mining problem based on real-life d	ata under supervis	sion of the
	lecturer.		
XP33PUD	Artificial Intelligence	ZK	4
	communication with a computer, phases of processing, syntactic analysis, grammars including DCG. Understanding a sentence, sem ganization. Knowledge engineering and knowledge elicitation. Machine learning -review of methods and tools. PAC learning. Learning i		=
momory of	and scheduling.	c. c. doi logio, II	
XP33RCV	Reading group in Pattern Recognition and Computer Vision	ZK	4
	with fundamental results in computer vision and pattern recognition. It targets the detailed study of principles which substantially influ		l
	performed in the form of a reading group. Each time, a person in charge presents a paper and the reading group participants join in v	-	mments and
discu	ission about the paper. The Reading group meetings are online and scheduled either on Tuesdays, or on Thursdays, from 11am (lasti	ng 60-90 mins).	

XP33RG2			
This is a reading an	Reading Group	ZK	4
This is a reading give	oup type course, where the student should get acquainted with important scientific articles in their field through critical analysis and r will each present one or more articles.	noderate discuss	ion. Students
XP33RMD	Control of Mobile Robots	ZK	4
-	Mobile Robots. Known Control Architectures. Top-Down and Bottom-Up Approaches. Overview and Comparison. Distributed Autonom		_
-	hbourhood Mapping. Needed Sensors. Ground of Ethology. Imprinting. Taxe. Stimuli, Receptors. Multiple Motivated Behaviour. React	_	
and Imitation. Mul	unity Robots Structure. Task- or Behaviour-Oriented Robots. Ways and Realisation of Robots Co-operation, Motivation, Observation ti-Agent reinforcement Learning. Q-Learning. Action Selection Mechanism, Learning Method, Exploration Strategy. Emotional Learning.	ng. Evolutionary	
	hetic Biology. Artificial Life. Virtual World Different Approaches. Robots Competition, RoboCup, Strategy Selection, Implementation. C	-	
XP33ROD	Pattern Recognition See https://cw.fel.cvut.cz/wiki/courses/xp33rod/start	ZK	4
XP33ROZ	Selected Topics in Pattern Recognition	ZK	4
-	c course in pattern recognition (e.g. P33ROD, 33RPZ). Selected topics: Anderson's problem, Kozince algorithm, kernel perceptron, r theorz. Deterministic learning. Unsupervised learning: Robbins algorithm and emprirical Bayesian approach. Expectation-minimizati		
	sequences and directed acyclic graphs. Markov models. Combination of weak classifiers: boosting and bagging. AdaBoost		
XP33RSK	Robust Statistics for Cybernetics	ZK	. 4
	s are basic tools of control and decision making theory. Classical statistical methods (e.g. MLE) are usually very sensitive to deviatio Is which are robust have been developed. It means that these methods are not so sensitive to small deviations from an underlying m		
•	ept of estimation and then we introduce the robust approach, some basic robust estimators of location (e.g. trimmed mean, Hampel of		
	robustness (influence function, breakdown point).		
XP33RSP	Management of Software Projects	ZK	4
XP33SCD	Man-Machine Systems	ZK	4
istory of man-mac	hine systems development. Human operator tasks. Manual control, supervisory control cognitive control. Typical structure of a control s	ystem. Distribution	on of priorities
	operator and machine. Control levels after Rasmussen. Skill based, role based and knowledge based operator behavior models. Fuz		
perator psycholog	y. Mental models. Human-machine interaction. Intelligent interface. Factors influencing operator behavior. Stress. Mental load. Human	error detection.	Man-machine
VD22CDD	system reliability. Man-machine systems simulators. User-centered system design.	71/	1 4
XP33SDD	Discrete Event Systems rete event systems. Modeling of discrete event systems, GRAFCET and it is applications with practical examples. Petri nets overview	ZK v Properties of P	4 etri nets and
	tems. Reduction methods, formal languages and algebraic description of PNs. Timed PNs and modeling in P- and T-timed PNs. Practi in CIM systems.		
XP33TPS	Foundations of the Possibilistic Measures	ZK	4
	lity measures can be sen as an alternative mathematical model for uncertainty quantification and processing, topical and intensively		times. They
are based on the	e maxitivity principle replacing the additivity principle applied in the classical measure theory. Besides the real-valued possibilistic me possibilistic measures taking their values in complete lattices will be introduced and analyzed.	asures also non-	numerical
XP33TTM	Text mining	ZK	4
XP33UID	Artificial Intelligence		
	ALUICIA ITICIIIUCIUC	ZK	4
asic terminologica	I issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, sta	ZK ate space search	
nd informedness o	<u> </u>	ate space search knowledge base	. Admissibility s. Knowledge
nd informedness o	l issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, sta f the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of	ate space search knowledge base	. Admissibility s. Knowledge
nd informedness o acquis XP33VID his course introdu	I issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, start the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of ition, induction from examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of pa 3D Computer Vision ces methods and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and the	ate space search f knowledge base ttern recognition. ZK eir essence well	Admissibility s. Knowledge 4 enough to be
nd informedness o acquis XP33VID This course introdu ble to build variant	I issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, start the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of ition, induction from examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of particles and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and the sof simple systems for the reconstruction of 3D objects from a set of images or video, for inserting virtual objects into the video signary from a sequence of images. The labs will be hands-on, and the students will gradually build a small functional 3D scene reconstruction.	ate space search f knowledge base ttern recognition. ZK eir essence well al source, or for c	Admissibility s. Knowledge 4 enough to be computing the
nd informedness o acquis XP33VID This course introdu ble to build variant ego-motion trajecto	I issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, start the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of ition, induction from examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of particles and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and the soft simple systems for the reconstruction of 3D objects from a set of images or video, for inserting virtual objects into the video signatory from a sequence of images. The labs will be hands-on, and the students will gradually build a small functional 3D scene reconstruction at https://cw.fel.cvut.cz/wiki/courses/tdv/start	ate space search f knowledge base ttern recognition. ZK eir essence well al source, or for c uction system. Up	Admissibility s. Knowledge 4 enough to be computing the o-to-date info
nd informedness o acquis XP33VID This course introdu ble to build variant ego-motion trajecto	I issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, staff the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of ition, induction from examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of particles and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and the soft simple systems for the reconstruction of 3D objects from a set of images or video, for inserting virtual objects into the video signary from a sequence of images. The labs will be hands-on, and the students will gradually build a small functional 3D scene reconstruction at https://cw.fel.cvut.cz/wiki/courses/tdv/start Computer Vision Theory and Practice	ate space search knowledge base ttern recognition. ZK eir essence well al source, or for d action system. Up	Admissibility s. Knowledge 4 enough to be computing the b-to-date info
xP33VTP xP33VTP xP33VTP xP33VTP xP33VTP xP33VTP	I issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, start the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of ition, induction from examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of particles and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and the soft simple systems for the reconstruction of 3D objects from a set of images or video, for inserting virtual objects into the video signatory from a sequence of images. The labs will be hands-on, and the students will gradually build a small functional 3D scene reconstruction at https://cw.fel.cvut.cz/wiki/courses/tdv/start	ate space search knowledge base ttern recognition. ZK eir essence well al source, or for c action system. Up ZK ally available. The	Admissibility s. Knowledge 4 enough to be computing the co-to-date info
XP33VID his course introducte to build variant ego-motion trajecte XP33VTP In the course, the cus on general meabelling algorithms	I issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, staff the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of ition, induction from examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of pa 3D Computer Vision ces methods and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and the soft simple systems for the reconstruction of 3D objects from a set of images or video, for inserting virtual objects into the video signary from a sequence of images. The labs will be hands-on, and the students will gradually build a small functional 3D scene reconstruction at https://cw.fel.cvut.cz/wiki/courses/tdv/start Computer Vision Theory and Practice PhD students will study selected sophisticated state-of-the-art computer-vision methods that have an efficient implementation public ethods that have been successfully used in a number of applications, including large scale search in high-dimensional spaces, deep restricted. The methods selected for the course evolve based on the current progress in the field; the selection is also alternated by the students.	ate space search knowledge base ttern recognition. ZK eir essence well al source, or for c action system. Up ZK ally available. The leural networks, a nts interests. The	Admissibility s. Knowledge 4 enough to be computing the o-to-date info 4 e course will and the graph
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XP34AT	TCAD Tools Applications	ZK	4
	he computer-aided technological design. Device simulators Atlas and Sentaurus: principle, applications. Basic equations. Boundary co		
	ation models. Avalanche ionisation models. Mobility models. Hands-on exercises on SUN workstations according to the tasks of studer		eses.
XP34CNO Theoretical and tec	Integrated Optics chological principles of IO Basic materials for IO. Light propagation in waveguide structures. Methods of waveguide structure design. Pri	ZK ismatic and gratic	1
	rule structures. Modal spectroscopy. Fundamental physical effects and interactions for IO. Preparation of dielectric waveguides and stru	-	
structures	s. Electro-optical modulators. Applicable measurement methods. Devices based on nonlinear effects. Semiconductor integrated opto-e	lectronic structur	es.
XP34DTM	DIAGNOSTICS AND TESTING IN MICROELECTRONICS	ZK	3
XP34EHA	Renewable Energy Microsources for Electronics - Energy Harvesting	ZK	4
	with system integration applied in the design of digital and analog systems with application of system engineering, in i tis solved intercent and application of system engineering. The source should be application of system engineering in it is solved intercent.		
	systems on a chip as well as external. The course shows new possibilities of realization and application of integrated micro-components ntities using mainly MEMS technology, increasing reliability with all its attributes. The course introduces modern elements - microactua	_	
	luding basic applications in industry, medicine, regulation, automotive control, etc. Basic elements of nanotechnology and nanoelectror		
here. The subject	extends students' expertise with the latest multidisciplinary chip elements and their wide use in information technologies, IoT, biomedia	cine, aerospace,	automotive
VD04ET0	industry etc.	71/	1 4
XP34ETS	Electrical Transport in Semiconductors ransport in semiconductors Electrical Transport in semiconductor crystals. Effective mass, mobility Boltzmann's transport equation. Scatter mechanisms, frequency. Scattering o	ZK n nhonons, ionise	4
	on. Relaxation time approximation Carrier transport in a strong electric field, velocity saturation. Carrier transport in magnetic field. Car	•	•
=	tum transport, density matrix, Green's and Wigner's functions. Resonance tunnelling, transport of electrons in superlattices. Single ele	=	
	blockade. Ballistic transport. Quantum Hall's effect. Simulation of transport effects.		
XP34IO	Integrated Optics	ZK	4
	in waveguide structures. Methods of waveguide structure design. Waveguide coupling elements. Gratings structures at waveguides. For IO. Design and preparation of dielectric and polymer waveguides and structures. Optical waveguide gratings. Passive waveguide str		
	nd thermo-optical effects and their use for IO. Structures for control of optical radiation Devices based on nonlinear effects. Semicond		•
	Optical components for informatics and sensors, multiplexing and optical processing. Applicable measurement methods, principles of r		
	optics application.		
XP34MSA	Microsystems and Microactuators	ZK	3
	with system integration applied in the design of digital and analog systems with application of system engineering, in i tis solved intercent and application of system engineering. The source should not provide a specific time and application of integrated migra components.		
	systems on a chip as well as external. The course shows new possibilities of realization and application of integrated micro-components ntities using mainly MEMS technology, increasing reliability with all its attributes. The course introduces modern elements - microactua	_	
	luding basic applications in industry, medicine, regulation, automotive control, etc. Basic elements of nanotechnology and nanoelectron		
here. The subject	extends students' expertise with the latest multidisciplinary chip elements and their wide use in information technologies, IoT, biomedia	cine, aerospace,	automotive
	industry etc.		
XP34MSY	Microsystems	ZK	4
	anta and algorification of migrosystems. Migro appears, Migro actuators, Cignal processing within the system, MEMS (migro electrical m		I
	epts and classification of microsystems. Micro-sensors. Micro-actuators. Signal processing within the system. MEMS (micro-electrical-mectrical structures). MEMOS (micro-electrical-mechanical-optical structures). Microsystem design. Microsystem modelling. Manufacturi	nechanical struct	ures). MOES
	epts and classification of microsystems. Micro-sensors. Micro-actuators. Signal processing within the system. MEMS (micro-electrical-mectrical structures). MEMOS (micro-electrical-mechanical-optical structures). Microsystem design. Microsystem modelling. Manufacturi Industrial applications. Medical applications.	nechanical struct	ures). MOES
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XP34SRS Semiconductor Radiation Sources ZK Stimulated emission in semiconductors. Homogeneous and heterogeneous junction, double heterostructure lasers and LEDs. Non-coherent LED's, super-luminescence diodes. Electromagnetic fields in semiconductor lasers. Types of lasers and their properties. Waveguide lasers, DFB and BFR structures. SQW and MQW lasers, quantum wells. Tunable injection lasers. Spectral line width and line stability. Radiating characteristic, coupling of the radiation source to a waveguide. Bi-stable and memory elements and switches. Semiconductor injection, waveguide amplifiers and wave convertors. Lasers and non-coherent diodes for optical communications. Measurement methods, applications. VLSI Structures and Technologies XP34STV Functional structures of the IC's. Bipolar and unipolar structures. BiCMOS structures. Sub-micron structures. Memory structures. Testing structures. VLSI technological processes. Advanced semiconductor technology. IC design, design of technology. Design rules. Reliability, yield. Outlooks and limitations of IC development XP34TOS Technology of Optical Devices Preparation of optoelectronic materials and structures. Diagnostic and testing methods. Design and preparation of double heterostructures. Preparation of semiconductor waveguides. Preparation of LED's, lasers, photo-resistors. Preparation of QW structures. Design of dielectric waveguide structures. Preparation of dielectric waveguide structures. preparation of optical radiation distributing structures. Design and preparation of optical radiation control structures. Measurement methods. Testing methods. Examples of semiconductor structures. Examples of dielectric structures. XP35CCM Cooperative Control of Multi-agent systems ZK Cooperative distributed control is a relatively novel and rapidly developing area of control theory and engineering. Instead of centralized, large systems are considered composed of autonomous subsystems, with local computation and communication capabilities. The broad aim is solving classical problems e.g. stabilization, tracking, estimation and optimization, via local communication and team cooperation robust to changes in communication topology and disturbance. Relevant topics of classical control theory are revisited and a brief review of background mathematics needed for the course is also provided. The potential use of multi-agent cooperation in challenging applications involving environment to be controlled or observed is discussed. Theory: Review of qualitative properties of dynamical systems, Motivation for distributed multi-agent systems, Elements of algebraic graph theory, Distributed estimation and control, Consensus and synchronization of linear/nonlinear, continuous/discrete-time systems, Cooperative stability, optimality and robustness, Distributed optimization: multi-player game theory, Interactions with environment. XP35CCM1 Cooperative control of multi-agent systems ZK Cooperative distributed control is a relatively novel and rapidly developing area of control theory and engineering. Instead of centralized, large systems are considered composed of autonomous subsystems, with local computation and communication capabilities. The broad aim is solving classical problems e.g. stabilization, tracking, estimation and optimization, via local communication and team cooperation robust to changes in communication topology and disturbance. Relevant topics of classical control theory are revisited and a brief review of background mathematics needed for the course is also provided. The potential use of multi-agent cooperation in challenging applications involving environment to be controlled or observed is discussed. Theory: Review of qualitative properties of dynamical systems, Motivation for distributed multi-agent systems, Elements of algebraic graph theory, Distributed estimation and control, Consensus and synchronization of linear/nonlinear, continuous/discrete-time systems, Cooperative stability, optimality and robustness, Distributed optimization: multi-player game theory, Interactions with environment. XP35ESF1 Estimation and filtering Methodology: experiment design, structure selection and parameter estimation. Bayesian approach to uncertainty description. Posterior probability density function and point estimates: MS, LMS, ML and MAP. Robust numerical implementation of least squares estimation for Gaussian distribution. Parameter estimation and state filtering - Bayesian approach. Kalman filter for white noise. Properties of Kalman filter. Kalman filter for colored/correlated noise. Fuzzy modeling and control In the initial lectures, the control-related fundamentals of fuzzy logic, fuzzy sets, fuzzy operations and relations are covered. Then the methodology of approximate reasoning and its interpretation using a basis of fuzzy rules is explained while deriving various types of inference mechanisms. Fuzzy system is interpreted as a nonlinear mapping, its properties and possibilities for approximation are discussed. These are then exploited for modeling fuzzy systems from measured data using gradient and least-squares techniques. We then cover thoroughly methods of fuzzy clustering analysis using three most popular algorithms: fuzzy c-means, Gustafson-Kessel and Gath-Geva algorithms. We then dedicate the lectures to the analysis and synthesis of Takagi-Sugeno fuzzy systems, that is, systems based on a model that was obtained either by linearizing along a trajectory or method of sections - both approaches are then compared. Careful discussion of various Lyapunov functions is included - quadratic, piecewise quadratic, fuzzy sharing the same segmentation of the state space as the linear submodels. The problems are formulated as convex optimization invoking the frameworks of linear matrix inequalities (LMI) and sums of squares (SOS). Finally, we also show basic design methods for fuzzy adaptive regulators, both direct (backstepping, fuzzy sliding mode control) and indirect (Fuzzy Model Reference Adaptive Control). Similar methods are finally applied for control using neural networks. XP35FMD ZK Fuzzy Modelling and Control 4 The goal of the subject is to introduce the up-to-date trends and results in the area of modelling and control of nonlinear systems based on fuzzy logic and neural networks. This includes especially analysis and synthesis of Takagi-Sugeno fuzzy systems, utilization of fuzzy systems and neural networks in control of nonlinear systems by approximation of unknown functions appearing in the description of the system, and design of adaptive fuzzy systems both direct and indirect. XP35FSC Flexible Structure Control ZK 4 The main aim of this course is introduction to methods of modeling flexible mechanics structures in order to optimization of placement of sensors and actuators. The robust control design of space modes will be follow. XP35FSC1 Flexible structures control ZK 4 The main aim of this course is introduction to methods of modeling flexible mechanics structures in order to optimization of placement of sensors and actuators. The robust control design of space modes will be follow. XP35LMI Linear Matrix Inequalities Semidefinite programming or optimization over linear matrix inequalities (LMIs) is an extension of linear programming to the cone of positive semidefinite matrices. LMI methods are an important modern tool in systems control and signal processing. Theory: Convex sets represented via LMIs; LMI relaxations for solution of non-convex polynomial optimization problems; Interior-point algorithms to solve LMI problems; Solvers and software; LMIs for polynomial mehods in control. Control applications: robustness analysis of linear and nonlinear systems; design of fixed-order robust controllers with H-infinity specifications. For more information, see http://www.laas.fr/~henrion/courses/lmi XP35LMI1 Linear matrix inequalities ZK Semidefinite programming or optimization over linear matrix inequalities (LMIs) is an extension of linear programming to the cone of positive semidefinite matrices. LMI methods are an important modern tool in systems control and signal processing. Theory: Convex sets represented via LMIs; LMI relaxations for solution of non-convex polynomial optimization problems; Interior-point algorithms to solve LMI problems; Solvers and software; LMIs for polynomial mehods in control. Control applications: robustness analysis of linear and nonlinear systems; design of fixed-order robust controllers with H-infinity specifications. For more information, see http://www.laas.fr/~henrion/courses/lmi Výsledek studentské ankety p edm tu je zde: http://www.fel.cvut.cz/anketa/aktualni/courses/XP35LMI XP35LSD Linear Systems 7K This course builds upon the master program lectures on Dynamical Systems Theory. The structure and properties of linear multi-input multi-output systems are studied. The significance of these results for the design of linear controls is demonstrated. The presentation focuses on pole placement techniques, linear state regulation and estimation, and LQG control design. State-space and transfer-function design techniques are compared. The lectures are supported by laboratory experiments using Matlab, Control System Toolbox, and Polynomial Toolbox XP35NES Nonlinear Systems ZK This course constitutes a continuation of the master level course "Nonlinear systems" being opened during winter semester. It is devoted to the detailed study of nonlinear systems structure from the control design point of view. It is based on state space descripion of nonlinear systems. Model transformations will be studied to simplify them and thereby faciliate the controllers design. It gives mathematical conditions for the existence of these transformations. Nonlinear analougues of controllability and observability will be introduced and studied

as well and their relation to detectability and stabilizability investigated. Finally, elements of nonlinear output regulation as well as of nonlinear robust and adaptive design will be presented. Exercises will be, in particular, based on MATLAB and SIMULINK use. XP35NES1 7K 4 Nonlinear systems The goal of this course is to help student develop a deeper and broader perspective on theory and applications of nonlinear systems. At the hearth of the course will be the so-called differential-geometric approach, which can be used for controllability and observability analysis of nonlinear systems, characterization of various types of exact feedback linearization and many other tasks. Great attention is paid to analysis of the structure of nonlinear systems from the perspective of control design. It follows from the state description of nonlinear systems and uses state transformations of the nonlinear model into a simpler form that is usable for control design. Differential-geometric conditions for existence of these transformations are studied in this course. Concepts of nonlinear controllability and observability are introduced in this course and their relation to stabilization and reconstruction is analyzed because it is not as clear as for linear systems. Some additional topics such nonsmooth stabilization and discontinuous stabilization will be covered. Examples of use of the presented theories in underactuated robotic walking, nonholonomic systems and optimization of biosystems will be given. XP35OFD Estimation and Filtering 7K Methodology: experiment design, structure selection and parameter estimation. Bayesian approach to uncertainty description. Posterior probability density function and point estimates: MS, LMS, ML and MAP. Robust numerical implementation of least squares estimation for Gaussian distribution. Parameter estimation and state filtering - Bayesian approach. Kalman filter for white noise. Properties of Kalman filter. Kalman filter for colored/correlated noise. XP35ORC1 Optimal and robust control This is an advanced course about modern control design methods that formulate the design as a mathematical optimization. Besides teaching practical design skills, the course will also help develop deeper understanding of fundamental concepts as well as build awareness of the latest results. Thanks to its background in mathematical optimization, the benefits of the course can certainly be seen beyond the borders of automatic control domain. The course can be viewed as an extension of the equal-named course in the master program. (B3M35ORR). However, numerous topics are new and those few topics that already appeared in the master version will be discussed at a significantly deeper level. This time the motivation is not just to give practical tool but also to go through the proofs, discuss various interpretations, and survey the results from the latest literature. From the student perspective, the goal of this course is to acquire advanced competences (knowledge and skills) in the area of computational design of control systems (or rather control algorithms). The methods will almost exclusively assume availability of a mathematical model of the system to be controlled (hence model-based control design). We will consider dynamical systems in continuous as well as discrete time, linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate the design task as an optimization, the crucial competences will come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) and infinite-dimensional (calculus of variations, operator theory, differential games). XP35RRD ZK Robust Control 4 Advanced course on selected topics in robust control. XP36ASP Architecture of Symbolic Computers ZK Symbolic expressions and abstract programs, lambda calculus, formal basis for abstract programming, self-interpretation, SECD abstract machine, memory management, demand-driven evaluation, Lisp implementations, predicate logic and its inference engine, Prolog inference engine and dynamic algebras, Warren abstract machine, optimisation, Prolog implementations, parallel inference engines. XP36DRO Diagnostics and Reconfiguration of Programmable Circuits The subject is aimed to help PhD students to understand better methods of reliability and availability improvement of SOC and NOC circuits built on FPGAs and ASICs Distributed Systems Communication mechanisms - message exchange, procedural communication (RPC, ORB), distributed shared memory. Process algebras - CSP, CCS, and pi-calculus, cooperating automata, Petri nets. Distributed execution, global state, causality, logical time. Algorithms of: exclusive access, leader election, deadlock detection/prevention, termination. Faults, resiliency, qourum algorithms, replication. Mobility, search in distributed systems - DHT. XP36DSY Distributed Systems Communication mechanisms - message exchange, procedural communication (RPC, ORB), distributed shared memory. Process algebras - CSP, CCS, and pi-calculus, cooperating automata, Petri nets. Distributed execution, global state, causality, logical time. Algorithms of: exclusive access, leader election, deadlock detection/prevention, termination. Faults, resiliency, qourum algorithms, replication. Mobility, search in distributed systems - DHT. XP36HS ZK Hypermedia Systems and Internet Computing 4 Hypermedia systems, basic models. Intelligent searching, adaptive navigation, personalization of access to web applications. Web intelligence, semantic web. Web engineering, main topics and the ways out. Internet computing. Modern technologies for web applications design. XP36JAI Languages for Artificial Intelligence ZK The course offers a deep insight into the two programming languages that are most frequently used in the domain of artificial intelligence (Lisp, Prolog). It exhibits programming paradigms used to build typical Al algorithms and gives some basics concerning the implementation of the two languages. XP36KP Communication Protocols ZK Communication protocol principles, SDL language, protocol architecture: ISO OSI, error control, data-link layer protocols: X.25, higher layer protocols (TCP, TP4), communicating finite state machines, implementation tools (FSM language ESTELLE, regular grammars), use of Petri nets, specification language LOTOS, protocol transformation, design, synthesis, validation and verification of protocols. XP36LSM ZK Logical Simulation 4 General introduction to simulation: fundamental ideas and principles of simulation systems, synchronous and asynchronous simulation. Simulation system VHDL and its use for simulation of digital circuits: data types, entities, architectures, sequential environment (processes, functions, procedures), signals and their attributes, resolution function, parallel environment (data-flow description, blocks, structural description), configuration of structural models. Students who completed course 36SIM cannot enroll. XP36NSN **Neural Networks and Neurocomputers** 7K 4 Theoretical background, paradigm classification and artificial neural networks learning methods. Student is supposed to propose and test the application of an artificial neural network for a partial issue concerning his dissertation theme during the semester. Procedure and results would be concluded in the preliminary publication form designed to be presentable on a scientific forum. Algebraic Specifications Prototyping XP36PAS 7K Algebraic specification, syntax and semantics of a specification language (OBJ3), structured specifications, generic specifications, implementation of an algebraic specification, interpretation using Prolog, translation into Lisp, term rewriting systems, abstract rewriting machine, prototyping of a specification, prototyping in OBJ3, conversion to procedural language (C++).XP36POA Advanced Parallel Algorithms Design and analysis of time-, and cost-efficient PRAM algorithms and parallel algorithms for distributed memory machines. The collection of algorithms includes: advanced parallel scan algorithms, distributed list ranking, Cole's MergeSort, optimal mesh sort, connected components, tree contraction and tree evaluation, pattern matching in texts. XP36PSV Parallel Systems and Algorithms Complexity measures and scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnection networks, embeddings, simulations. Communication algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations. Fundamental parallel algorithms - reduction, prefix computation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexity theory Graduates of engineering studies in specialization Computer Science and Informatics FEE CTU cannot register.

XP36RSY Reconfigurable Systems ZK Systems that have reconfigurability as a part of normal function. Technology of reconfiguration., partially reconfigurable devices. Reconfiguration control and management, collaboration with operating systems, software support. Design and verification of reconfigurable systems, algorithms, EDA tools. Reconfiguration in System on Chip (SoC). Codesign issues in SoC. Seminars, experiments with reconfigurable devices, case study, literature research. XP36SEP Seminars on Architectures of Parallel Computers ZK 4 Overview of architectures of high-performance computers and trends in technologies. Memory coherence and sequential consistency models. Shared-memory architectures: buses and switches, bus-based cache coherence protocols and synchronization mechanisms. Virtual shared memory architectures: distributed cache-coherence protocols. Synchronization mechanisms - barriers. Clusters: fast communication networks and protocols. XP36STR Stringology ZK Processing of strings and sequences. General, ordered alphabet. Generalized and weighted strings. Finite and infinite alphabet. Searching in text, dictionaries and languages. Exact and approximate matching. Forward and backward matching. Searching in compressed text. Searching in more-dimensional text. Searching for longest common factors and subsequences. Searching for regularities in text. Construction of covering of text. Representation of text, prefix, suffix and factor automata, suffix trees and arrays. **Advaced Computer Architecture** Instruction level parallelism (pipelined, superpipelined and superscalar systems). Basic limitations to parallelism (structural, data and control hazards). Instruction fetch and execution methods (in order, out of order). Register data flow, software and hardware solutions, interlocking, scoreboard, control stack. Memory reuse, register renaming. Modern RISC processors. Parallel systems, performace evaluation, HPCC, supercomputers. Shared memory multiprocessors (bus, switch, switched memory). Interconnection structures. Cache coherence mechanisms for multiprocessor systems. MIMD systems UMA, NUMA, COMA. Distributed memory multiprocessors (crossbar switch). Data flow systems, multithreading. Accelerators, special architectures. XP36VAV ZK XP36VPD Selected Parts of Data Mining ZK 4 Data mining aims at revealing non-trivial, hidden and ultimately applicable knowledge in large data. This course focuses on two key data mining issues: data size and their heterogeneity. When dealing with large data, it is important to resolve both the technical issues such as distributed computing or hashing and general algorithmic complexity. In this part, the course will be motivated mainly by case studies on web and social network mining. The second part will discuss approaches that merge heterogeneous prior knowledge with measured data. Bioinformatics will make the main application field here. It is assumed that students have completed the master course on Machine Learning and Data Analysis (A4M33SAD) **Applied Electroacoustics** Review of basic equations in acoustics, modeling of miniature acoustic elements in thermoviscous fluid, equivalent circuits based approximation, review of principles of electroacoustic transduction, acoustic transmitters and receivers, waveguides for transducers, membranes and plates in transducers, modeling of coupling between mechanical and acoustical parts in transducers, electrostatic microphones and their models, MEMS microphones. XP37AEM Acoustic and Electroacoustic Measurements Z,ZK Measurement of acoustic pressure, measuring microphones. Measurement of acoustic impedance. Foundamental audiometric measurements, artificial ear. Measurement of acoustic power. Methods of calibration of measuring microphones. Method of reciprocity. Method of reciprocity in the field of the spherical wave, in the diffusion sound field. Calibration methods for accelerometers and sensors of velocity and displacement. Measurement of mechanical impedance, impedance head, artificial mastoid. Electrostatic transducer and its application for electroacoustic measurements. Measurement of thin membranes and air-gaps. Acoustic intensity measurement. Measurements of acoustic transmitters. XP37APF Acoustics and Electroacoustics of Solid State Waves in elastic isoptropic unbounded continuum. Wave equation. Scalar and vector potential. Plane harmonic uniform and non-uniform wave. Energy and power in plane harmonic wave, Plane wave in half-space, reflection and refraction of a plane wave at an interface between too solids, P-wave, SV and SH waves, Rayleigh waves, Waves in wave -quides in solids. Wave propagation in cylindrical wave-guide. Solid-state waveguides of non-uniform cross-section. Piezoelectricity. Equivalent circuits of piezoelectric transducers for generation of volume and surface waves. XP37AR Speech Acoustics ZK 4 Vocal tract, anatomy, physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech. XP37ARA Architectural Acoustics Wave theory, geometrical and statistical acoustics. Acoustical lining and sound absorption. Objective room acoustic parametres. Subjective criteria for auditory quality of halls. Room acoustics measurement technique. Physical modelling and numerical simulation of sound propagation. Electroacoustic sound reinforcement. Acoustical properties of buildings: absorption of sound, sound insulation. Simple and complex constructions. Criteria for sound insulation properties of building constructions. Measurement in acoustics of constructions. Calculations in room acoustics. XP37CAD Advanced methods for circuit analysis and optimization using computer-aided design Z,ZK The first part of the subject deals with contemporary models of both classical semiconductor elements (in submicron domain) and special microwave transistors as HBT, pHEMT etc. Moreover, models of power MOS (LDMOS) transistors are also defined and characterizing the elements by X-parameters is included as well. The modeling part of the subject is completed by characterization nano-scale elements, including noise models, and by a description of memristors, memcapacitors and meminductors. The second part of the subject contains algorithms for solving nonlinear stiff systems of differential-algebraic equations in implicit form combined with nonstandard sensitivity analysis in time domain. The sensitivity analysis in the frequency domain is also included as well as nonstandard sensitivity analysis of noise figure. Attention is also given to steady-state algorithms, in particular, their more difficult form usable for autonomous circuits. The analytic methods are naturally complemented by single- and multi-objective optimizations. Up to four-dimensional optimizations are demonstrated on very complicated, but technically useful tasks from the microwave area including power RF amplifiers. XP37DRS Satellite communication and navigation systems Z.ZK 4 Satellite communication - overview. Systems for fixed and mobile service. Satellite networks: Intelsat, Eutelsat, Inmarsat, Intersputnik, Astra. Orbits (LEO, MEO, GEO, HEO) and parameters of satellite communication channel. Energetic budget of satellite link. Satellite link design. Frequency bands. Modulations and multiplexes: TDMA, FDMA and CDMA. Spread spectrum communication. Systems VSAT, DAMA, DVB-S, S-UMTS. Multimedia satellite services. Satellite navigation systems: GPS, GLONASS and GALILEO. Satellite communication and navigation systems integration - CNS systems. XP37ELA Elastoacoustics ZK 4 The course deals with interactions of elastic structures with gaseous medium, namely vibrations of plates, radiation impedances, modal equations, influence of walls surrounding acoustic space, finite element method, calculation of eigenfrequencies. XP37FHA Physiological, Psychological and Musical Acoustics Anatomy of the hearing organ, hearing theory, hearing field, loudness, masking, pitch of sound, temporal tresholds, distortion in the hearing organ, adaptation, fatigue and impairment of hearing system, Binaural hearing, objective and subjective properties of musical signals, statistical and dynamical analysis, Perception of simple tones and complex sounds, consonancy and dissonancy. Psychoacoustics of transmission of the musical signal. Methods of psychoacoustic measurements, their validity, repeatability. Planning and realization of listening tests, methods of statistical analysis of results, interpretation. XP37FHA1 Physiological, Pychologycal and Musical Acoustics 1 ZK Properties of musical signal in temporal and frequency domains, methods of sound synthesis, timbre and interpretation of sound spectra, objective assessment of timbre, theory of sound quality, introduction to acoustics of speech and singing, physical.-acoustic principles of musical instruments, tuning, dynamics, timbre of the tone, radiation properties of musical instruments, introduction to methodology of measurement of musical instruments.

XP37FHA2	Physiological, Psychological and Musical Acoustics 2	ZK	4
	ical signal in temporal and frequency domains, methods of sound synthesis, timbre and interpretation of sound spectra, objective ass		re, theory of
und quality, introd	duction to acoustics of speech and singing, physicalacoustic principles of musical instruments, tuning, dynamics, timbre of the tone, i	radiation properti	es of music
	instruments, introduction to methodology of measurement of musical instruments.		
XP37FOS	Photonic Imaging Systems	ZK	4
	esentation. Energetic image description. Principles of image acquisition, transferring and storing. Image entropy function, 2 dimension		
	escription. Novel compression techniques. Image reproduction, matrix description. Light diffraction. 2D transfer functions - PSF, MTF,		
etection systems	. 2D transfer systems and their signal distortion, image aberration and their correction, toleration analysis of optical system. Receiver	s and transmitter	s for specia
	application. Photonic processors, computers and memories.		_
XP37FOT	Selected Parts from Photonics	Z,ZK	3
-	sed on the overview of recent applied photonic topics esp. integral and panoramic photonics receivers, transmitters and other special e		-
	al background. Selected examples of applied photonic elements and subsystems will be demonstrated in lab experiments and results		•
ercises will take p	purchased under the specialized departmental laser lab for limited number of participants. Selected experiments will also be presented during le	ciures. The durat	ile equipme
XP37FZS		Z,ZK	4
	Fuzzy Signal Processing ation and their research activities are focused on the problems of utilize fuzzy logic and neural network for optimization algorithm used a		1
ib students educe	as adaptive filtration, diagnostic of the signal, control phase lock and so on.	at numericai sign	ai processii
XP37GAB	Genesis and Analysis of Biosignals	ZK	4
	rith genesis and description of the most important biological signals of both electric and non-electric nature. Properties of the biosignal,		1
-	ocessing, are studied. Finally, simple and advanced methods of biosignals pre-processing, analysis and evaluation are presented for		-
XP37IAR	Implementation algoritms in radioelecronics	Z,ZK	4
- 1	ucation and their research activities are focused on the problems of effective implementation algorithms in radio electronics by signal	•	
	units (universal and signal processors) and with support hardware accelerators in FPGA circuits. Optimization of the algorithm is con		
	computational complexity by utilization multirate digital signal processing and hardware accelerators.		
XP37IPP	Image Processing and Photonics	ZK	4
- 1	discipline used in space technology. Students will become acquainted with advanced imaging photonics used in space sciences, incluing the control of the con		1
	its and the influence of the environment. In addition, there are included parts describing the parameters of optical instruments (PSF, N		
•	formation modeling and removal methods for IR - VIS electromagnetic radiation. The subject also includes a description of the senso		
ise parameters a	nd the reconstruction of the acquired image, and discusses its use in space applications. In addition, there are parts including Earth Rer	mote Sensing, mi	ssion desig
nd the use of mod	ern instruments in this area, including optical Fourier transform, electromagnetic wave polarization research, and hyperspectral imagi	ng and data prod	essing in th
	area, including image data telemetry.		
XP37ISS	Introduction to space science and technology	ZK	4
Introduction to	space sciences and technology on PhD level. Methods and resources of space research and their applications. Satellites, space prob	es, space station	ns, space
transportation sy	stems, their development, proposals and design. Optoelectronic systems for space, onboard systems and payload, space communic		
	otomo, thou development, proposale and design. Optionis systems for opass, embodia systems and payioda, opass seminants	ation and naviga	tion, space
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XP37LN	nology. Remote sensing and multispectral images, applications. Space physics, cosmic environment, cosmic radiation and particles.	_	-
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Electrochemical, optical, biochemical sensors. Haematology analysers. Interference, corrections of measured values, standardisation in medicine. Electrostimulation. of internal organs and skeletal muscles. Electrodes and circuits for biopotential measurement and electrical stimulation. Indirect measuring methods of biological and physical values. XP37RAD ZK 4 Radioelectronics XP37RUP Radio determination of position, theory and practice, experience Z,ZK 5 The main aim of the subject is to acquaint a doctoral student with receiver position determination methods in systems using different measurements and position determination algorithms (least-squares methods ...) and with their accuracy. The student will study error magnitude derivation and will get information concerning the choice of compromises between convergence rates and precision. It will be revealed that massively used satellite navigation methods suffer from many deficiencies under real environment conditions. It will be shown how the impact of these weaknesses can be reduced by the assistance from other sensors based on radio as well as non-radio principles. Moreover, there are very prospective methods of positioning based on Signals of opportunity processing; they are included in the course, too. The student will verify the achieved results by individual laboratory project exploiting instrumental equipment like a signal generator with simulator of satellite signals and generators of communication signals (DVB-T, LTE). The acquisition of the equipment was supported by the development project OP VVV. XP37SFA Fundamentals of Physical Acoustics ZK 4 Classical theory of elasticity, Carthesian tensors. Theory of small deformations, dynamic equations of isotropic elastic medium. Microscopic model of fluids. Cinematics of fluids. Dynamics of vascous fluids. Stationary flow of vascous fluid. Radio Receivers Special Technology ZK Introduction to advanced radio receivers technology. Basic structure classical and modern software defined radio receivers. Technical parameters radio receivers. Specific features radiobroadcasting and television receivers. Professional radiocommunication receivers and transceivers. Diversity techniques. Spread spectrum radio receivers. Low noise narrowband and broadband amplifiers. Oscillators and frequency synthesizers. Mixers and demodulators. Radio receivers system design. Statistical Signal Processing Parameter estimation and detection theory. General properties and fundamental limits. ML, LS, Bayes (MAP,MSE), NP, MM estimators and detectors. Adaptive filter theory (Kalman, RLS). Iterative detection and parameter estimation. XP37TAS Acoustic signal processing and theory Z.ZK Acoustic signal classification, sources, description of properties. Statistical analysis of acoustic signals. Spectral analysis of signals, Fourier transform application. Time-frequency analysis, Short-time Fourier Transform, Wavelet transform, Wigner-Ville distribution. Cepstral analysis and its application in acoustics. Discrete signal processing and its effect to sound perception. Oversampling, noise shaping. Granulation noise, dithering, signal requantization. Acoustic signal acquisition and data pre-processing. Impulse measurements of electro-acoustic systems. System analysis using swept and time delayed acoustic signals. Pseudorandom signals and their application in acoustic system analysis. Digital processing of musical signals. Theoretical Eletroacoustics Vibrating systems in fluids and solids. Systems of lumped and distributed parameters in solids. Equivalent circuits of membranes and plates. Reciprocal transducers with magnetic and electric field. Non-reciprocal transducers (opto and thermoacoustical transducers, piezoresistive transducer). Electromechanical and electroacoustical transducers with lumped and distributed elements. Radiation, radiation impedance. Acoustic transmitters, directivity. Acoustic receivers. Acoustical systems with lumped and distributed elements. Acoustic waveguides, air-gaps. Coupled systems. XP37TEM Theoretical Electroacoustics and Measurement The course is aimed at selected parts of electroacoustics and related fields with the emphasis on the theoretical aspect. The main interest lies in electroacoustic transducers and their parts. Their description will include non-linear mode. The part on measurement will include mainly calibration methods and their usage in cases close to topics of theses of doctoral students. XP37TMP Medical Instrumentation The subject deals with principles and properties of medical systems for analysis of body fluids, blood gas analysis, medical minors of basic life functions (ECG, pulse oxymetry EEG, etc.), thermodynamic principles of anaesthetic equipment and equipment for artificial lung ventilation, haematological analysers and other medical apparatuses XP37VKF Selected Parts from Photonics Anatomy and physiology of vision. Integral photonic sensors. Panoramatic (image) photonic sensors. Integral photonic displays. Panoramatic photonic displays. Electron optics. Image converters. Special photonic elements. Basic elements of optical systems. Fundamentals of illumination. Fiber-optics elements and systems. Optical methods of information processing. Optical (photonic) processors. XP37VRA Research Seminars in Radioelectronics and Acoustics Z,ZK 4 The course is intended for PhD students of the radioelectronics and acoustics specialization. It develops the presentation skills and serves as a platform for discussion and defence of students' research results. Information recording Magnetic recording theory. FM signal recording. Video information recording systems. High density recording, tape recorder thin heads. Impulse recording and reproduction. Digital recording on CD-audio, DAT. Digital recording on CD-ROM, CD-video. WORM, CD-R recording. Erasable magneto-optical recording on MD. Digital video recording. Coding, data compression. XP37ZSN1 Signal processing in satellite navigation systems 1 Z.ZK 4 Distance measurement with pseudorandom signals and with carrier. Position determination based on measured distances. Time delay discriminator. Schema of range navigation receiver. GDOP, PDOP, HDOP, VDOP. GPS system, precision. Glonass and its precision. GALLILEO. Comparison of these systems. XP37ZSN2 Signal processing in satellite navigation systems 2 Doppler satellite navigation systems, structure of receiver and precision of position measurement. Shortcomings of satellite systems: limited access and integrity, RAIM and GIC, augmentation. Differential systems DGPS and DGLONASS, RTCM-104 standard. Systems SKY-FIX, FUGRO, RACAL, WAAS, EGNOS. GALILEO and its prospective. GPS III. The subject introduces the principles and technical means of data acquisition in the laboratory and industrial environment. Attention is paid to both hardware and software aspects of the integration of systems for data acquisition and process control. Laboratory exercises are designed in part in the form of classical tasks, partly in the form of problem-oriented tasks in the field of programming of automated measurement systems and control of measurement processes. Electromagnetic Compatibility of Data Acquisition Systems XP38EMC 7K 4 EMC - basic terms. Measurement of electromagnetic emission and immission. EMC standards. Modelling of disturbing signals. Electromagnetic disturbance in laboratory and industry. Design of DAQ systems with regard to EMC. EMC of data transmitting lines. XP38MDR Methods of Signals Digitalization and Reconstruction ZK The up-to-date and unconventional methods of analog preprocessing of typical sensors signals, selection of optimal digitization methods and optimization of hardware solution including of processing of measurement results to achieve high accuracy and effective suppression of disturbing signals. XP38MET Metrology ZK 3 The course is focused on solving problems connected with the metrology of electrical quantities and application of modern tools to it. The lectures acquaint students with the up-to-date methods of precise measurement of electrical quantities with an accent to correct evaluation of accuracy. XP38MMN Measurement of Nonelectric Quantities ZK Physical principles of sensors. Measurement of temperature, pressure, flow, movement, position and other physical quantities. Chemical sensors and analyzers, biosensors, metal detectors, detection of explosives. New types of signal conditioning circuits. Sensor Applications in industry, transport and consumer electronics. Security and military applications. Sensor design and technology. Signal processing in sensor systems, intelligent sensors.

XP38MPM Methods for Precision Measurement of Electrical Quantities and Measurement Data Processing	ZK	4
Quantum standards of electrical quantities. Collective standards. Inductive ratio devices for precision electrical measurements and possibilities of improving		
Modern methods for precision measurement of active and passive electrical quantities. Evaluation of measurement errors and uncertainties. Metrologica of measurement data.	i reliability. Statistic	cai anaiysis
XP38MPX Magnetism in Engineering Practice	ZK	4
Students will be introduced into the magnetic materials, magnetic sensors and engineering magnetism including FEM design and magnetic measurement		-
this advanced course can be modified according to the students' needs.		
XP38PSL Aircraft Instrumentation	ZK	4
The subject acquaints students with the current technology used in aircraft with respect to instruments, systems and sensors working in the low-frequent to the current technology used in aircraft with respect to instruments, systems and sensors working in the low-frequent to the current technology used in aircraft with respect to instruments, systems and sensors working in the low-frequent technology.	-	
basic processing of system data. The course includes a detailed description of aircraft instrumentation and its resistance to external influences, a description of aircraft instrumentation and its resistance to external influences, a description of emergence and power electrical engineering, analysis of instruments and systems for measurement of engine and aerometric quantities, and a description of emergence	•	
It thus develops the background related to nowadays technology and methodology utilized on aircraft. The course provides a detailed overview of quantities are a detailed overview of quantities.		•
and analytical methods and their integration into signal/data processing and aircraft system design principles. The last part of the course discusses the	•	
the field of aircraft instrumentation.		
XP38PUC XP38PUC	ZK	2
XP38SSA	ZK	3
The course is focused on advanced sensors and data communication principles within heterogeneous automotive networks. It especially deals with me sensors communication over the internal vehicle communication infrastructure.	odern wideband at	itomotive
XP38SSB Sensors and Buses	ZK	4
The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical principle		-
parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration and diag	nostics, noise and	disturbance
immunity.		
XP38SYS Measurement and Data Acquisition Systems	ZK	4
The subject introduces the principles and technical means of data acquisition in the laboratory and industrial environment. Attention is paid to both hard the integration of systems for data acquisition and process control. Laboratory exercises are designed in part in the form of classical tasks, partly in the form.		•
in the field of programming of automated measurement systems and control of measurement processes.	in or problem-one	enteu tasks
XP38VDI Selected Chapters of Diagnostics	ZK	4
This course introduces advanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, and p	rinciples and instru	umentation
of non-destructive testing, the corresponding advanced signal processing, and self-acting evaluation in order to improve reliability, availability, mail	ntenance, and life-	time.
XP38VKP Selected Parts of Instrumentation	ZK	. 4
The course is dedicated to principle, properties and applications of selected special measuring instruments. It deals mainly with calibrators and other sidevices for measurement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC measurement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC measurement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC measurement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC measurement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC measurement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC measurement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC measurement of extremely low voltage and current signals.		_
analyzers, metallic and optical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement method		
XP38VKZ Selected Chapters of Signal Processing	ZK	4
The course is dedicated to advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns e.g.	ງ. the other types ດ	of integral
transformation (except Fourier), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality inc	reasing of multime	dia signal
transmission, etc.	71/	4
XP39CG Advanced Computational Geometry The aim of the course is to deepen the knowledge of computational geometry. The course is designed primarily for students who have a dissertation top	ZK	4 tructures in
computer graphics and effective work with them. The starting point of the study will be chapters from the compulsory literature, specific topics will be ba		
develop the issue. Students will have the latest articles on the subject and will creatively process the theme. This is mainly about mastering the methodo		
into account the subject of the dissertation. Precisely this aspect (the methodology of scientific work in the given field) is one of the added values of the	subject. The subje	ct, with its
theoretical character, invites directly to the above-defined concept.	71/	
XP39PMV Advanced Methods of Visualization Scientific visualization based on physical models. Scientific visualization and volume rendering. Volume graphics. Information visualization. Interaction	ZK	4 dization
environment. Scientific visualization in WWW environment. Particle models and visualization of technological processes. Computational f		ilization
XP39SCG Seminar in Comnuter Graphics	ZK	4
The Seminar in Computer Graphics will make students familiar with selected research topics from computer graphics srrch aq efficient renderino method		
fheir nntical nronerties qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics methods used	· · · · · · · · · · · · · · · · · · ·	
image processing, computer vision, and human computer interaction. The goal of the course is to expound the selected topics to students and in the same skills by analyzing existing high quality research rvork. A significant added value is the acquaintance of students with methods of scientific work in conne	•	
gathered knowledge to solve specific problems of their PhD theses.	Stion with the aim t	or dailing the
XP39SPG Computer Graphics Seminar	Z,ZK	4
The computer graphics seminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface materia	als and their optical	properties,
simulation of natural phenomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used in related		
image processing, computer vision and human computer interaction based on the particular topics of PhD theses of the participating students. The goa the selected topics to the students and by analyzing selected highly influential research publications to further develop the research capabilities.		introduce
XP39UID Advanced methods of UI design	ZK	4
The goal of the course is to introduce advanced methods for user interface and interaction design in non-standard environments, such as virtual and au	Į.	
gain theoretical background related to human interaction in such environments. During the course students will get familiar with a set of techniques for de		
systems in non-standard environments, especially in virtual and augmented reality with collaborative aspects.		
XP39VIZ Advanced Visualization Methods	ZK	4
Human factors in visualization (Perception and cognition, Visual saliency, Visual thinking) Design of User Interfaces for Visualization applications (Evaluation Advanced volume visualization (Illustrative volume rendering) Big data visualization, Visual analytics, Animation for visualization, Data compression and		
visualization Visualization (illustrative volume rendering) big data visualization, visual analytics, Alimation for visualization, bata compression and visualization visu	Treduction Large s	scale data
XP39VPG Computational Geometry	ZK	4
Principles of computational geometry (CG), data structures and paradigms, methods of geometric search, convex polygons and hulls, applications of co		
Voronoi diagrams, triangulation, efficient intersection algorithms, intersection of semispaces and polygonal regions, geometry of rectangles, dual mapping	gs and spaces, co	nvex hull in
dual space, algorithms of computer graphics and CG. Students who completed course 36VGE cannot enroll.	717	4
XP39VR Virtual reality Advanced methods in the VPMI language. Standard and non-standard extensions to the VPMI language. Programming of external applications with E	ZK	4
Advanced methods in the VRML language. Standard and non-standard extensions to the VRML language. Programming of external applications with Ea	Al interfered Marie:	
reality. Distant cooperation in virtual environment. Hardware and software support for virtual reality systems. QuickTime VR. Specifica		iser virtual

XPE04SCWR Scientific Writing Z 4

1) LECTURES [Chang-Hee Won]: With the assistance of a Fulbright Distinguished Chair at CTU and a Professor in Electrical Engineering for Temple University (a research university located in Philadelpia, Pennsyvania, USA), researchers will be instructed on how to organize and effectively communicate their scientific results. While this instructor is an Electrical Engineer, the approaches will be applicable to all technical disciplines. 2) SEMINARS [Michael Ynsua]: Under the guidance of a native-speaking English teacher participants will focus on the fundamentals of academic writing with the goal of sharpening critical writing skills (reasoning, formulating, and developing arguments and explanations). Special attention will also be paid to mechanics, usage, and style (grammar, etc).

For updated information see http://bilakniha.cvut.cz/en/f3.html Generated: day 2025-11-20, time 19:34.