## 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

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 Ond ej Ji í ek (Gar.)	ZK	4	2P	L	S
XP37AEM	Acoustic and Electroacoustic Measurements 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, Dana Saláková 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 Petra Juna Jennings (Gar.)	NIC		4C	Z,L	S
XP04A2	English language 2 Petra Juna Jennings Petra Juna Jennings (Gar.)	NIC		4C	Z,L	S
XP04A2ZK	English language 2	ZK	0		Z,L	S
XP34AT	TCAD Tools Applications 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  Josef Kolá Josef Kolá Neur en (Gar.)	ZK	4	2P+2S	L	S
XP37ARA	Architectural Acoustics Libor Husník Libor Husník Libor Husník (Gar.)	ZK	4	2P+2S	L	S
XP31ART	Architectures for Real Time Implementation	ZK	4	2P+2S	L	S
XP38ATM	·	ZK	3	2P+2D		S
XP02BFY	Biophysics	Z,ZK	4	2P+2C	Z	S
XP33BID	Bionics	ZK	4	2P+2S	Z	S
XEP33CML	Computational Intelligence Techniques for Machine Learning	Z,ZK	4	1P+1S	L	S
XEP35CMS	Computational Methods for Materials Science Antonio Cammarata Antonio Cammarata (Gar.)	Z,ZK	4	2P+2C	Z,L	S
XP04 1	Czech language 1 Dana Saláková	NIC	0	4C	Z,L	S
XP04C1ZK	Czech language 1 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 Dana Saláková	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 Giulia D'Angelo, Jan Kybic, Karel Zimmermann, Miroslav Kulich, Michaela Valentová 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	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	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 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
XP16EPM	Economics of power markets Jaroslav Knápek	ZK	4	2P+4D	Z,L	S

XP16ERE	Economics of power generation from RES  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  Jan Kyncl Jan Kyncl (Gar.)	Z,ZK	4	2P+2S	L	S
XP02EVA	Physics for Electroenergetics Pavel Kubeš Pavel Kubeš Pavel Kubeš (Gar.)	ZK	4	3P	Z	S
XP34ETS	Electrical Transport in Semiconductors  Jan Voves Jan Voves (Gar.)	ZK	4	2P+2C	Z	S
XP17ELD	Electrodynamics  Lukáš Jelínek	ZK	4	2P+2C	Z	S
XP14EMC	Electromagnetic Compatibility  Zden k e ovský Zden k e ovský (Gar.)	ZK	4	2P+2C	Z	S
XP14ECD	Electromagnetic Compatibility  Zden k e ovský	ZK	4	4+0s	Z	S
XP38EMC	Electromagnetic Compatibility of Data Acquisition Systems  Jan Holub Jan Holub Jan Holub (Gar.)	ZK	4	2P+2C	Z	s
XP15EH	Energy Economy Zden k Müller	Z,ZK	4	2P+2S	L	s
XP15EZP	Control in Power Engineering	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 (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 (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 Jan Hamhalter Jan Hamhalter (Gar.)	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	ZK	4	2P+2C	L	S
XP35FMC1	Fuzzy modeling and control	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 (Gar.)	Z,ZK	4	2P+2S	Z	S
XP02FPL	Solid State Physics Antonio Cammarata Antonio Cammarata (Gar.)	ZK	4	2P+2C	L	S
XP34ASD	Physics of Advanced Semiconductor Devices and Materials  Jan Voves Jan Voves (Gar.)	ZK	4	1P+3C+3D	Z,L	S
XP13FPD	Semiconductor Physics Vít zslav Benda Vít zslav Benda (Gar.)	Z,ZK	4	2P+2S	Z	S
XP02FPT	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 2	ZK	4	2P+2S	L	S
XP37GAB	Genesis and Analysis of Biosignals	ZK	4	3P+1S	L	S
XP33GAD	Geometrical Algebras Pavel Pták	ZK	4	2+0s	L	S
XEP33GMM	Graphical Markov Models	ZK	4	2P+1S	Z	S

XP16HKA	Historical structures and technologies in architecture	NIC	2	0P+4S	Z,L	s
XP16HDS	History of Transport Systems and Communications  Marcela Efmertová	ZK	2	0P+4S	Z,L	S
XP16HEL	History of Electrical Engineering  Marcela Efmertová	NIC	2	0P+4S	Z,L	S
XP16HIS	Historiography of the Development of Science, Technology and the Methodology	ZK	4	2P+2S	Z,L	S
XP02HS	Zden k Beneš, Zden k Beneš Zden k Beneš (Gar.)  Noise Surveys	ZK	4	1P	L	S
XP02H5	Ond ej Ji í ek	ZN	4	IP	L	S
XP36HS	Hypermedia Systems and Internet Computing Ivan Jelínek Ivan Jelínek Ivan Jelínek (Gar.)	ZK	4	2P+2S	L	S
XP37IAR	Implementation algoritms in radioelecronics	Z,ZK	4	2P+2S	Z	S
XP33IMD	Informatics in Clinical Medicine	ZK	4	2P+0S	L	S
XP01ITZ	Integral Transforms and Z Transform	ZK	4	2+1	Z	S
XP34IO	Integrated Optics Václav Prajzler, Vít zslav Je ábek, David Mareš 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 Josef Kolá	ZK	4	2P+2S	Z	S
XP33CHM	Chapters in higher mathematics  Mirko Navara, Pavel Pták Pavel Pták Pavel Pták (Gar.)	ZK	4	2P		S
XP01KAS	Complexity and Combinatorical Algorithms  Marie Demlová	ZK	4	2+1	L	S
XP36KP	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  Vít zslav Je ábek, Ji í tyroký <b>Ji í tyroký</b> Ji í tyroký (Gar.)	ZK	4	2P+2C	Z,L	S
XP16ECM1	Quantitative research methods in economy 1 Lubomír Lízal Lubomír Lízal Lubomír Lízal (Gar.)	ZK	4	2P+4D	Z	s
XP16ECM2	Quantitative research methods in economy 2  Lubomír Lízal	ZK	4	2P+4D	L	S
XP16KVM	Quantitative Research Methods in Management	ZK	4	2P+2S	L	S
XP01KVP	Quantum Computing	ZK	4	2+2	Z	S
XP17LAE	Medical Applications of Electromagnetic Field  Jan Vrba Jan Vrba (Gar.)	ZK	4	2P+2C	L	S
XP37LN	Aircraft Navigation 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 (Gar.)	ZK	4	2P+2C	Z	S
XP02MHD	Magnetohydrodynamics 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 Pavel Pták	ZK	4	2P+2S	L	S
XP34MTP	Materials and Technologies for Photonic Devices and Structures	ZK	3	2P	Z	S

	Václav Prajzler Václav Prajzler (Gar.)					
XP01MTP	Matrix Calculus Pavel Pták	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 Stanislav Vitek Miloš Klima	ZK	4	4P+0S	Z	S
XP17MVP	Methodology of Science Stanislav Vítek Stanislav Vítek (Gar.)	ZK		2P+2C	Z	S
XP33MMD	Analysis and visualization methods for medical data  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 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 Miroslav Husák Miroslav Husák (Gar.)	ZK	4	2P+2C	Z,L	S
XP34MSA	Microsystems and Microactuators Miroslav Husák Miroslav Husák (Gar.)	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 Beš ák Zden k Be vá Zden k Be vá (Gar.)	ZK	4	2P + 2C	Z	S
XP33MOL	Modal Logics for Distributed Systems	ZK	4	2P+0S	Z	S
XP13MSD	Modelling and Simulation of Technological Systems Pavel Mach Pavel Mach (Gar.)	Z,ZK	4	2P+2C	Z	S
XP33ICT	Modern ICT for Industry and Smart Grids	ZK	4	2P+0S	L	S
XP02MPF	·	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 Jan Vobecký (Gar.)	ZK	4	2P+2C	Z,L	S
XP14MZR	New Control Methods for Electric Drives Ji í Lettl Ji í Lettl (Gar.)	ZK	4	2P+2C	Z	S
XP14MPD	Advanced Control Methods of Electric Drives	ZK	4	4+0s	Z	S
XP37MPS	Multimedia Signals Transmission  Václav Žalud Václav Žalud	ZK	4	2P+2S	Z	S
XP37NAV	Navigation systems Pavel Ková	ZK	4	2P+2L		S
XP31NOS	Design and circuit structures of electronic systems Ji í Hospodka Ji í Hospodka (Gar.)	ZK	4	2P+2S	L	S
XP31DIF	Digital filter synthesis 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	ZK	4	2P+2C		S
XP35NES	Nonlinear Systems	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 Jan Machá Jan Machá (Gar.)	ZK	4	2P+2C	L	S
XP34EHA	Renewable Energy Microsources for Electronics - Energy Harvesting  Miroslav Husák Miroslav Husák Miroslav Husák (Gar.)	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 <b>Ji í Hájek</b> 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  Jan Hamhalter	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 Pavel Hazdra (Gar.)	ZK	3	2P	L	S
XP34SRS	Semiconductor Radiation Sources Vít zslav Je ábek, Zden k Burian Vít 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 Al	ZK	4	2P+0S	L	S
XP34ADM	Principles and Applications of Device Models  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 (Gar.)	ZK	4	2P+2L	Z	S
XP38PUC	Jan Kona Jan Kona Jan Kona (Jan.)	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	Jana Nosková <b>Jana Nosková</b> Jana Nosková (Gar.)  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 Zden k Müller (Gar.)	Z,ZK	4	2P+2S	Z,L	S
XEP17SWR	Scientific Writing	ZK	4	2P+2S	*	S
XPE04SCWR	Scientific Writing Dana Saláková	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 Mirko Navara	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 i Bittner	ZK	4	2P		S
XP39SPG	Computer Graphics Seminar	Z,ZK	4	2P+2S	L	S
XP36SEP	Ji í Bittner, Daniel Sýkora Daniel Sýkora Ji í Bittner (Gar.)  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 <b>Ji í Novák</b> Ji í Novák (Gar.)	ZK	3	2P+1C		S
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XP13SSD	Special Methods of Devices Quality Evaluation  Václav Papež Václav Papež Václav Papež (Gar.)	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 Petr Kulhánek, Antonín Krpenský Antonín Krpenský Petr Kulhánek (Gar.)	Z,ZK	4	3P+1S	L	S
XP37SZS	Statistical Signal Processing Pavel Sovka, 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 Vojt ch Franc Vojt ch Franc (Gar.)	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	Z,ZK	4	2P+2C	L	S
XP13SJD	Quality Control Systems Pavel Mach, Martin Molhanec 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	<b>Technology of Optical Devices</b> Václav Prajzler, Vít zslav Je ábek <b>Václav Prajzler</b> 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 Libor Husník (Gar.)	Z,ZK	3	2P+2L	L	S
XP02TF1	Theoretical Physics 1 Petr Kulhánek, 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  Jan Sýkora	Z,ZK	4	1P+1S	Z,L	S
XP16VPB	Science, Technology and Industrial Boom  Marcela Efmertová Marcela Efmertová Marcela Efmertová (Gar.)	ZK	4	2P+2S	Z,L	S
XP39VR	Virtual reality David Sedlá ek, Ji í Žára David Sedlá ek Ji í Žára (Gar.)	ZK	4	2P+2S	L	S
XP02VNP	Plasma Waves and Instabilities Petr Kulhánek, Antonín Krpenský Petr Kulhánek Petr Kulhánek (Gar.)	Z,ZK	4	3P+1C	Z	S
XP16DEL	History of technology and economic  Marcela Efmertová, Jan Mikeš Marcela Efmertová (Gar.)	ZK	2	0P+4S	L	S
XP37VKF	Selected Parts from Photonics Miloš Klima Miloš Klima (Gar.)	ZK	4	4P+0S	L	S
XP37FOT	Selected Parts from Photonics Miloš Klima František Rund Miloš Klima (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 Viktor Hruška Viktor Hruška (Gar.)	ZK	4	2P	L	S
XP02VPB	Selected Topics of Physics B Viktor Hruška Viktor Hruška Viktor Hruška (Gar.)	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	ZK	4	2P+2S	L,Z	S
XP36VAV	Šerzod Tašpulatov <b>Šerzod Tašpulatov</b> Šerzod Tašpulatov (Gar.)	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 Pavel Ctibor Pavel Ctibor Pavel Ctibor (Gar.)	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  Jan Hamhalter	ZK	4	2+1	Z	S
XP16ZVP	Fundamentals of Scientific Work  Marcela Efmertová Marcela Efmertová (Gar.)	ZK	4	2P+2S	Z,L	S
XP01ZWT	Wavetet Transform.  Jan Hamhalter	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 Vít zslav Je ábek (Gar.)	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	ZK	4	2P+2S	Z	S

XP02AME	Active Methods in Acoustics	ZK	
XP02AMA	Active Methods in Acoustics	ZK	4
hysical principles,	nterference, Huygens principle, sound field in ducts, vawe-guides and enclosures. Active noise control in a duct. One or more	secondary sources	. Active control
n enclosures, acous	tic coupling, modes, local control. Feedback and feedforward strategy, analog adn digital realisations, algorithms based on LMS,	stability of algorith	ms, multichann
algorithms. Practical	realisations of active systems. Active control of vibrations, transducers for active control.		
XP37AEM	Acoustic and Electroacoustic Measurements	Z,ZK	4
Measurement of acc	oustic pressure, measuring microphones. Measurement of acoustic impedance. Foundamental audiometric measurements, arti	ficial ear. Measure	ment of acoust
ower. Methods of c	alibration of measuring microphones. Method of reciprocity. Method of reciprocity in the field of the spherical wave, in the diffusi	on sound field. Ca	libration method
or accelerometers a	ind sensors of velocity and displacement. Measurement of mechanical impedance, impedance head, artificial mastoid. Electros	static transducer a	nd its application
or electroacoustic m	neasurements. Measurement of thin membranes and air-gaps. Acoustic intensity measurement. Measurements of acoustic tran	nsmitters.	
XP37APF	Acoustics and Electroacoustics of Solid State	Z,ZK	4
	otropic unbounded continuum. Wave equation. Scalar and vector potential. Plane harmonic uniform and non-uniform wave. Ene		
	half-space, reflection and refraction of a plane wave at an interface between too solids. P-wave, SV and SH waves. Rayleigh waves.		•
olids. Wave propag	ation in cylindrical wave-guide. Solid-state waveguides of non-uniform cross-section. Piezoelectricity. Equivalent circuits of piez	oelectric transduce	ers for generation
of volume and surface	· · · · · · · · · · · · · · · · · · ·		
of volume and surface	Speech Acoustics	ZK	4
of volume and surface	· · · · · · · · · · · · · · · · · · ·		4
of volume and surface KP37AR /ocal tract, anatomy	Speech Acoustics		4
of volume and surface  KP37AR  Yocal tract, anatomy  KP31ASN  Information about th	Speech Acoustics , physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech Algorithms and Structures of Neurocomputers e basic principles and possibility of the application of the neural informative technology for the signal processing are the main to	beech.  ZK copic. The lectures	4 are devoted to
of volume and surface XP37AR /ocal tract, anatomy XP31ASN information about the he introduction into	Speech Acoustics  , physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech analysis and Structures of Neurocomputers  e basic principles and possibility of the application of the neural informative technology for the signal processing are the main the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural	zK opic. The lectures I network application	4 are devoted to
of volume and surface KP37AR /ocal tract, anatomy KP31ASN information about the introduction into processing are investigation.	Speech Acoustics , physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech Algorithms and Structures of Neurocomputers e basic principles and possibility of the application of the neural informative technology for the signal processing are the main to	Deech.  ZK Opic. The lectures I network application	4 are devoted to
of volume and surface KP37AR /ocal tract, anatomy KP31ASN information about the introduction into processing are investigation.	Speech Acoustics  , physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech analysis and Structures of Neurocomputers  e basic principles and possibility of the application of the neural informative technology for the signal processing are the main the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural	zK opic. The lectures I network application	4 are devoted to
of volume and surface XP37AR Vocal tract, anatomy XP31ASN Information about the introduction into processing are invest XP34AIC Functional structure	Speech Acoustics  physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech analysis and Structures of Neurocomputers  a Algorithms and Structures of Neurocomputers  be 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 stigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are details. Bipolar and unipolar structures. BiCMOS structures. 3D structures. Sub-micron structures. Memory structures. Test	Deech.  ZK Opic. The lectures I network application escribed.  ZK Sting structures. VL	4 are devoted to ons at the signa
f volume and surface (P37AR ocal tract, anatomy (P31ASN offormation about the introduction into rocessing are invested and control of the con	Speech Acoustics  , physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech Algorithms and Structures of Neurocomputers  e basic principles and possibility of the application of the neural informative technology for the signal processing are the main 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 details.	Deech.  ZK Opic. The lectures I network application escribed.  ZK Sting structures. VL	4 are devoted to ons at the signa
f volume and surface (P37AR focal tract, anatomy (P31ASN information about the introduction into rocessing are invested (P34AIC functional structure rocesses. Advance	Speech Acoustics  physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech analysis and Structures of Neurocomputers  a Algorithms and Structures of Neurocomputers  be 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 stigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are details. Bipolar and unipolar structures. BiCMOS structures. 3D structures. Sub-micron structures. Memory structures. Test	Deech.  ZK Opic. The lectures I network application escribed.  ZK Sting structures. VL	4 are devoted to ons at the sign:
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Cepters (Explores: Public Key Enelphering- Hains Functions and Data Integrity, Entity Identification and Autoritication. Digital Signatures. Key Management Techniques (Effective Implementation of Supporting Againstime. Patent Pendings and Standards.)  XP17APL Applied Optical Controllers in Medicina Society and Standards. And the Computer simulation of the cardiovascular system. In medical diagnospics. Fundamental physiology of the viscolar system. Internodynamics, skin anatomy and pertison. Computer simulation of the cardiovascular system. UV. VIS and IR spectroscopy. Fundamental optics of the eye and color analysis, Optical parameters of biological tissue. Dispersion of light, Design of optical sensors. Optical sustaination profingly in sustaination profingly in sustaination of profities of the eye and color analysis. Optical parameters of biological tissue. Dispersion of light, Design of optical sensors. Optical visualisation profitiples for translations and advanced programs, undertail actuals, format based on the profit of the profi	XP32AKR	Applied Cryptography	ZK	4
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Scope and aims of non-investive measurement techniques in medical diagnostics. Fundamental physiology of the vascular system, hemodynamics, skin anatomy and pertuinal computer similarities of the cardiovascular system. VIV. Vis. and IR spectroscopy. Fundamental optics of the vey and ordior analysis, Optical variants sizes. Dispersion of light. Design of optical assors. Optical visualisation principles of translumiscetion and temography. Optoelectronic systems in medicine.  XP 3PASAP   Architecture of Symbolic (Computers Symbolic Computers Symbolic despressions and abstract programs, learnboths calculus, formal basis for abstract programming, self-interpretation. SECO abstract machine, permanent of the evaluation. List principles and temperature and programs. In the self-interpretation of the evaluation is inference engine. Probleg inference engine and dynamic algebras, Warren abstract machine, permanent of the engine interpretation of the engine and dynamic algebras, Warren abstract machine, permanent of the engine interpretation of the engine and dynamic algebras, Warren abstract machine, permanent of the engine interpretation of the engine and dynamic algebras, Warren abstract machine, permanent of the engine interpretation and distriction of the interpretation of the engine interpretation and distriction of the interpretation and distriction of the engine interpretation insection and distriction of the interpretation and insulation. Single and complex constructions. Chiera for sound insulation properties of building constructions. Measurement in accounts of constructions. Chiera for sound insulation properties of building constructions. Measurement in accounts of constructions of the engine processing was expected and patients of constructions of the engine processing and processing under the processing and processing of the processing and proces			71/	4
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of light. Design of optical serosors. Optical visualisation principles of transluminoscion and tomography. Opticelectronic systems in medicine.  XPAGASP  Architecture of Symbolic expressions and dastract grograms, lambdas calculus, formal basis for abstract programming, self-interpretation, SECI abstract machine, permoy management, demand-driven equation, Lusg implementations, permode a logic and its inference engine. Prolog inference engine and dynamic algebras, Warren abstract machine, optimisation, Prolog implementations, permode and statistical accoration. Prolog implementations, permode and statistical accorations. Accusational programment in accusation programment exhibition. Prological modelling and numerical simulation of sound programment exhibition. Prological modelling and numerical simulation of sound programment exhibition. Prological modelling and unumerical simulation of sound programment exhibition. Prological modelling and unumerical simulation of sound programment exhibition. Prological modelling and sound insulation. Simple and complex constructions. Criteria for sound insulation such accusation and sound insulation. Simple and complex constructions. Criteria for sound insulation insulation accusation and sound insulation. Simple and complex constructions. The surface insulation of sound programments and programmants and sound insulation. Simple and complex constructions. Accusation and insulation accusation and sound insulation and insulatio	1		-	
XP36ASP Architecture of Symbolic Computers Symbolic programming, self-interpretation, SECD abstract machine, memory management, demand-driven evaluation, Lips implementations, predicate logic and its inference engine. Prolog inference engine and dynamic algebras, Warren abstract machine, optimisation, Prolog implementations, practile inference engines.  XP37ARA Architectural Acoustics  XP37ARA Architectural Acoustics  XP37ARA Architectural Acoustics  XP37ARA Architectural Acoustics  XP37ARA Architectural Acoustics in a distallation of sound processor in the processing of sound, sound insulation. Simple and complex constructions. Circle for sound, sound insulation. Simple and complex constructions. Circle for sound, sound insulation. Simple and complex constructions. Order for Sound, sound insulation in Simple and complex constructions. Order for Sound Sound insulation processing units and synthesis of data paths for DSP implementation processing time. Sequential and parallel processing units and synthesis of data paths for DSP implementation strategies of DSP algorithms. Influence of algorithm modification on the implementation processing time. Sequential and parallel processing, Numerical characteristics of algorithms. Implementation alternatives, dedicated hardware and programmable signal processors. Architectures of signal signal processors with fixed point and floating points. Developments tools for real time processing, Analysis of real time implementation of the integration of signal signal processors with fixed point and floating points. Developments tools for real time processing, Analysis of real time implementation of programmable signal processors. Architectures of signal signal processors with fixed point and floating points. Developments tools for real time processing, Analysis of real time implementation of programmable signal processors. Architecture and programmable signal processors are designed in part in the form of classical tasks, partly in the form of programmable signal processors. Are de			ers of biological lis	sade. Dispersion
Symbolic expressions and abstract programs, lambda calculus, formal basis for abstract programming, self-interpretation, SECD abstract machine, optimisation, Prologi implementations, parallel inference engine, Prologi implementations, parallel inference engines.  Wave theory, geometrical and statistical acoustics.  Wave theory, geometrical and statistical acoustics. Acoustical lining and sound absorption. Objective room acoustic parameters. Subjective criteria for auditory quality of halls. Room acoustics measurement redmique. Psysical modelling and numerical simulation of sound propagation. Electroacoustic sound reinforcement. Acoustical properties of buildings absorption of sound, sound insulation. Simple and complex constructions. Celeration for sound insulation properties of building constructions. Measurement in accustes.  XP31ART  Architectures for Real Time Implementation  Architectures of central processing units and synthesis of data paths for DSP Implementation strategies of DSP algorithms. Influence of algorithm modification on the implementation processing units and synthesis of data paths for DSP Implementation alternatives, dedicated hardware and programsable signal processors. Architectures of digital signal processors with fixed point and floating points. Developments tools for real time processing, Analysis of real time implementation for communications.  XP38ATM  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 programsiming of automated measurement systems and control of measurement processes.  XP02BFY  Biophysics  Application in treatment of read or lung insufficiency. The students will like in his oriented processes and states and activities of the control of	<del></del>		<i>7</i> K	4
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XP37ARA   Architectural Acoustics   ZK   4			-	
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nocessing time. Sequential and parallel processing. Numerical characteristics of algorithms. Implementation alternatives, dedicated hardware and programmable signal processors with fixed point and floating points. Developments tools for real time processing. Analysis of real time implementation of FFT, digital filtres and special algorithms for communications.  XP38ATM  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 proble—oriented tasks in the field of programming of automated measurement systems and control of measurement processes.  XP02BFY  Biophysics  XP02BFY  Biophysics  XP02BFY  Biophysics  XP38BID  Bionics  XP38BID  Bionics  XP38BID  Bionics  XP38BID  Bionics  XP38BID  XP38B			l .	
Architectures of digital signal processors with fixed point and floating points. Developments tools for real time processing. Analysis of real time implementation of FFT, digital filters and special algorithms for communications.  XP38ATM   Sample   Sampl				· ·
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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.  XP02BFY Biophysics Place to blood flow, measurement of haemodynamic parameters in vivo, properties of blood vessels. Special attention will be given to artificial capillary systems and their application in treatment of renal or lung insufficiency. The students will learn how to measure blood pressure under various degrees of load and they will observe their own ventilation parameters. Theoretical knowledge will be complemented by practical experience from excursions.  XP33BID Bionics  R2R3BID Bionics  R2R3BID Bionics  Relationship: biology + technology = bionics. Bionics Classification. An overview of biological principles and its technological parallels: reproduction, growth, movement, breathing, heart action, digestion, excrementation, thermoregulation, vision, hearing, taste, smell, sense of touch, speech, memory. Neural and neuronal systems. Motion control. Biosensors and sensors for robotics. Information transfer in biotechnological systems. Biosystems diagnostics. Orientation and navigation. Functional supports, internal and external substitutes, bio-proteineses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems intelligent input and output filters. Support system for creative thinking.  XEP33CML Computational Intelligence Techniques for Machine Learning  Learning objective:become familiar with the theory and applications of computational intelligence methods in the context of systems capable of learning from data. Introduction, motivation for learning, computational intelligence. Supervised,	special algorithms for co	mmunications.		•
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.  **POZBFY****   **Biophysics**   **Polysical processes related to blood flow, measurement of haemodynamic parameters in vivo, properties of blood vessels. Special attention will be given to artificial capillary systems and their application in treatment of renal or lung insuficiency. The students will learn how to measure blood pressure under various degrees of load and they will observe their own ventilation parameters. Theoretical knowledge will be complemented by practical experience from excursions.  **XP33BID**   **Bionics**   **B	XP38ATM		ZK	3
In the field of programing of automated measurement systems and control of measurement processes.  XPO2BFY  Biophysics  Biorics  Biori	The subject introduces t	he principles and technical means of data acquisition in the laboratory and industrial environment. Attention is paid to both h	nardware and soft	ware aspects of
XP02BFY			the form of probler	n-oriented tasks
Physical processes related to blood flow, measurement of haemodynamic parameters in vivo, properties of blood vessels. Special attention will be given to artificial capillary systems and their application in treatment of renal or lung insuficiency. The students will learn how to measure blood pressure under various degrees of load and they will observe their own ventilation parameters. Theoretical knowledge will be complemented by practical experience from excursions.  XP33BID Bionics   Relationship: biology + technology = bionics. Bionics Classification. An overview of biological principles and its technological parallels: reproduction, growth, movement, breathing, heart action, digestion, excreemtation, thermoregulation, vision, hearing, taste, smell, sense of touch, speech, memory. Neural and neuronal systems. Motion control. Biosensors and sensors for robotics. Information transfer in biotechnological systems. Biosystems modelling, Biosystems diagnostics. Orientation and navigation. Functional supports, internal and external substitutes, bioprotheses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems. Intelligent input and output filters. Support system for creative thinking.  XEP33CML   Computational Intelligence Techniques for Machine Learning  XEP33CML   Computational intelligence. Supervised, unsupervised and reinforcement learning paradigms. Fuzzy systems, neural networks, neuro-fuzzy systems, and other general function approximators for supervised learning. Fuzzy custering methods for unsupervised learning. Reinforcement learning for single-agent and multi-agent systems: Examples of applications and case studies. The course will be connected with - a computer assignment with Mattab/Simulink and a literature assignment.  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			7 71/	
and their application in treatment of renal or lung insuficiency. The students will learn how to measure blood pressure under various degrees of load and they will observe their own ventilation parameters: Theoretical knowledge will be complemented by practical experience from excursions.  XP33BID  Relationship: biology + technology = bionics. Bionics Classification. An overview of biological principles and its technological parallels: reproduction, growth, movement, breathing, heart action, digestion, excrementation, thermoregulation, vision, hearing, taste, smell, sense of touch, speech, memory. Neural and neuronal systems. Motion control. Biosensors and sensors for robotics. Information transfer in biotechnological systems. Biosystems modelling. Biosystems diagnostics. Orientation and navigation. Functional supports, internal and external substitutes, bioprotheses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems. Intelligent input and output filters. Support system for creative thinking.  XEP33CML  Computational Intelligence Techniques for Machine Learning  Z,ZK  4  Learning objective.become familiar with the theory and applications of computational intelligence methods in the context of systems capable of learning from data. Introduction, motivation for learning, computations for supervised learning. Fuzzy clustering methods for unsupervised elarning. Reinforcement learning for single-agent and multi-agent systems. Examples of applications and case studies. The course will be connected with -a computer assignment with Matab/Simulink and a literature assignment.  XEP35CMS  Computational Methods for Materials Science  The final goal of the course, the students will known: the fundaments of thermodynamical properties; - how the Schrödinger equation is setup and substitute and substitute and substitutes and -a general protocol through which to design new materials at the atomic scale. By means of simulation laboratory experience, the students will known: will				
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Relationship: biology + technology = bionics. Bionics Classification. An overview of biological principles and its technological parallels: reproduction, growth, movement, breathing, heart action, digestion, excrementation, thermoregulation, vision, hearing, taste, smell, sense of touch, speech, memory. Neural and neuronal systems. Motion control. Biosensors and sensors for robotics. Information transfer in biotechnological systems. Biosystems modelling. Biosystems diagnostics. Orientation and navigation. Functional supports, internal and external substitutes, bio-protheses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems. Intelligent input and output filters. Support system for creative thinking.  XEP33CML Computational Intelligence Techniques for Machine Learning  XEP33CML Computational Intelligence Techniques for Machine Learning objective-become familiar with the theory and applications of computational intelligence methods in the context of systems capable of learning from data. Introduction, motivation for learning, computational intelligence. Supervised, unsupervised and reinforcement learning paradigms. Fuzzy systems, neural networks, neuro-fuzzy systems, and other general function approximators for supervised learning. Fuzzy clustering methods for unsupervised learning, Reinforcement learning for single-agent and multi-agent systems. Examples of applications and case studies. The course will be connected with - a computer assignment with Matlab/Simulink and a literature assignment.  XEP35CMS Computational Methods for Materials Science  Technique 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 calculat		·	and they will obec	or vo thon own
Relationship: biology + lechnology = bionics. Bionics Classification. An overview of biological principles and its technological parallels: reproduction, growth, movement, breathing, heart action, digestion, excrementation, thermoregulation, vision, hearing, taste, smell, sense of touch, speech, memory. Neural and neuronal systems. Motion control. Biosensors and sensors for robotics. Information transfer in biotechnological systems. Biosystems modelling. Biosystems diagnostics. Orientation and navigation. Functional supports, internal and external substitutes, bioprotheses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems. Intelligent input and output filters. Support system for creative thinking.  XEP33CML   Computational Intelligence Techniques for Machine Learning Learning objective:become familiar with the theory and applications of computational intelligence methods in the context of systems capable of learning from data. Introduction, motivation for learning, computational intelligence. Supervised, unsupervised and reinforcement learning paradigms. Fuzzy systems, neural networks, neuro-fuzzy systems, and other general function approximators for supervised learning. Fuzzy clustering methods for unsupervised learning. Reinforcement learning for single-agent and multi-agent systems. Examples of applications and case studies. The course will be connected with - a computer assignment with Matlab/Simulink and a literature assignment.  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 thermodynamical norder 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 activation physical quantities; -	· ·		ZK	4
sensors for robotics. Information transfer in biotechnological systems. Biosystems modelling. Biosystems diagnostics. Orientation and navigation. Functional supports, internal and external substitutes, bioprotheses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems. Intelligent input and output filters. Support system for creative thinking.  XEP33CML   Computational Intelligence Techniques for Machine Learning	!			nt, breathing,
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tor creative thinking.    XEP33CML   Computational Intelligence Techniques for Machine Learning   Z,ZK   4     Learning objective:become familiar with the theory and applications of computational intelligence methods in the context of systems capable of learning from data. Introduction, motivation for learning, computational intelligence. Supervised, unsupervised and reinforcement learning paradigms. Fuzzy systems, neural networks, neuro-fuzzy systems, and other general function approximators for supervised learning. Fuzzy clustering methods for unsupervised learning. Reinforcement learning for single-agent and multi-agent systems. Examples of applications and case studies. The course will be connected with - a computer assignment with Matlab/Simulink and a literature assignment.    XEP35CMS   Computational Methods for Materials Science   Z,ZK   4			• • • •	
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function approximators for supervised learning. Fuzzy clustering methods for unsupervised learning. Reinforcement learning for single-agent and multi-agent systems. Examples of applications and case studies. The course will be connected with - a computer assignment with Matlab/Simulink and a literature assignment.  XEP35CMS   Computational Methods for Materials Science   Z,ZK   4    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.  XP04 1   Czech language 1   NIC   0    XP04C1ZK   Czech language 2   ZK   0    XP04C2ZK   Czech language 2   ZK   0    XP04C2ZK   Czech language 2   ZK   0    XP04C2ZK   Czech language 2   NIC   0    XP04C3LS   Czech language 2   NIC   0    XP04C3LS   Czech language 3   NIC   0    XP04C3LS   Czech language 4   NIC   0    XP04C3LS   Czech language 5   NIC   0    XP04C3LS   Czech language 6   NIC   0    XP04C3LS   Czech language 7   NIC   0    XP04C3LS   Czech language 8   NIC   0    XP04C3LS   Czech language 9   NIC   0    XP04				
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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.  XP04 1 Czech language 1 NIC 0  XP04C1ZK Czech language 2 ZK 0  XP04C2ZK Czech language 2 ZK 0  XP04 2 Czech language 2 NIC 0  XP31DSP Digital signal processing TK 4  This course builds on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the needs of doctoral studies in the	course, the students will	$know: - the fundaments \ of \ thermodynamics, \ newtonian \ and \ statistical \ mechanics, \ and \ how \ the \ relative \ formalism \ is \ implementation \ and \ statistical \ mechanics.$	ented in order to o	calculate
learn how to setup and run simulations, and how to analyse and present the results by using post-processing softwares.  XP04 1 Czech language 1 NIC 0  XP04C1ZK Czech language 2 ZK 0  XP04C2ZK Czech language 2 NIC 0  XP04 2 Czech language 2 NIC 0  XP31DSP Digital signal processing ZK 4  This course builds on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the needs of doctoral studies in the	1			
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XP04C1ZK Czech language 1 ZK 0 XP04C2ZK Czech language 2 ZK 0 XP04 2 Czech language 2 NIC 0 XP31DSP Digital signal processing ZK 4 This course builds on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the needs of doctoral studies in the	<u> </u>		NIC	
XP04C2ZK       Czech language 2       ZK       0         XP04 2       Czech language 2       NIC       0         XP31DSP       Digital signal processing       ZK       4         This course builds on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the needs of doctoral studies in the		· · ·		
XP04     2     Czech language 2     NIC     0       XP31DSP     Digital signal processing     ZK     4       This course builds on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the needs of doctoral studies in the		• •		
XP31DSP Digital signal processing  ZK 4  This course builds on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the needs of doctoral studies in the				
This course builds on the basic courses of digital signal processing in master's degree, develops and deepens the knowledge corresponding to the needs of doctoral studies in the				
			1	· ·
and on 1 D digital processing. It covers spectral and deportal analysis, parametric metricus, optimal ETT niters, frequency analysis, metricus of analysis of relations between time series.				
	area or 1-D signal proces	oomig. it corres openial and copenial analysis, parametric metricus, optimal Errillers, frequency analysis, metricus of allalysi	o or relations betw	CONTRINE SCHES.

	Digital signal processing	ZK	4
XP33RG2	Reading Group	ZK	4
	type course, where the student should get acquainted with important scientific articles in their field through critical analysis a	and moderate disc	ussion. Student
xP33RCV	Reading group in Pattern Recognition and Computer Vision	ZK	4
	Reading group in Pattern Recognition and Computer vision fundamental results in computer vision and pattern recognition. It targets the detailed study of principles which substantially in	l	
	formed in the form of a reading group. Each time, a person in charge presents a paper and the reading group participants join		=
discussion about the p			
XP13DFD	Data and Functional Analysis of Production Systems	Z,ZK	4
	of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information is of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods o		
	is of enterprise. Date base of technical preparation of production, Methodology of functional analysis of enterprise. Methods of time analysis of enterprise user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise		•
-	tion and standards for data and functional analysis. Automation of analysis methods, CASE tools.	. 000 0 0	in analysis si
XP13DEZ	Degradation processes of electridal equipment	Z,ZK	4
	s students with the basic processes of degradation, which is exposed to the electrical product in a production environment. The		-
	r a model operating environment. The student should try to verify the dominant degradation process of the product in the laborated as a process of the process of the product in the laborated as a process of the product in the laborated as a process of the proce		its computer
XP16HPH	also paid to environmental aspects associated with the choice of materials (technology) that are able to limit the degradation	<u> </u>	1
	History of Physic	ZK	4
XP34ORD	Optical Radiation Detection and Detectors  gnetic radiation, radiometric and photometric units. Detection of optical radiation, Ideal detectors, internal and external photo-effe	ZK	4 a-effect detectors
•	gnetic radiation, radiometric and priotometric units. Detection of optical radiation, ideal detectors, internal and external prioto-ent ial photo-effect detectors, PN junction. PIN photodiode, physical principles, properties. Avalanche photodiode, physical princip	· · · · · · · · · · · · · · · · · · ·	
•	perties. Thermal energy conversion detectors. Bolometers, thermocouples. Pyroelectric detectors. Some other detector types. C		
•	r cells, properties. Measurement methods, applications.		
XP36DRO	Diagnostics and Reconfiguration of Programmable Circuits	ZK	4
	b help PhD students to understand better methods of reliability and availability improvement of SOC and NOC circuits built on		1
XP34DTM	DIAGNOSTICS AND TESTING IN MICROELECTRONICS	ZK	3
XP15DVN	Diagnostics of HV and EHV Insulating Systems	Z,ZK	4
	n, fault sources and mechanisms. Indoor and outdoor insulation of electrical equipment. Diagnostic methods, using in operatior f database systems for electrical machines and equipment of HV and EHV. Application of systems with element of artificial int		-
XP02DP	Electric Discharges and their Applications	ZK	4
	c discharges. Townsend?s theory. Glow discharge. Processes on the surface of electrodes. Technological applications. Plasm	l	1
microwave discharge.	Arc. Corona. Spark discharge. Lightning. Ball lightning. Z-pinch and its properties. Electromagnetic collapse. X-ray sources, co	ontrolled fusion. G	eneration of
magnetic fields of Ear	h.		
XP13DTF	Thin film diagnostics	Z,ZK	4
	on. Definition of a thin film. Deposition methods; chemical vapor deposition, physical vapor deposition. Thin film characterization	on: optical method	ls; electron
XP32DZS	ation. X-ray diffraction and photoelectron spectroscopy. Thickness, mechanical, optical and electrical properties.		
	Digital Signal Dragging in Ialagammunications	71/	4
	Digital Signal Procesing in Telecommunications  Sizing of communications networks	ZK	4
XP32DKS	Sizing of communications networks	ZK	4
XP32DKS XP33DID	Sizing of communications networks  Distributed Artificial Intelligence	ZK ZK	4
XP32DKS XP33DID In winter semester 202	Sizing of communications networks	ZK ZK anning. Cooperation	4 4 on. Coordination
XP32DKS XP33DID In winter semester 202 Communication. Complanning. Blackboard s	Sizing of communications networks  Distributed Artificial Intelligence 3/24 the course runs for the last time. In future years, it will not be opened anymore. Distributed problem solving. Multiagent planunication strategies, message passing. Various AI approaches, case studies. Types of agent behavior. Negotiation. Organizarystems. Client-server systems. Peer-to-peer systems. Implementation aspects of distributed knowledge-based systems. Lear	ZK ZK anning. Cooperational structuring.	4 4 on. Coordination Partial global
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XP32DKS XP33DID In winter semester 202 Communication. Comit planning. Blackboard of Meta-agent. Agents are XP36DSV Communication mechal automata, Petri nets. Description of the Agents and Agents are selliency, qourum algover automata, Petri nets. Description of Satellite communication are selliency, qourum algover and payable of satellite communication are selliency, qourum algover and navigation system XP14DSD Assumptions for electrof collector machine. Espectrum communication of selectric machines play to provide the students or FEM will be developed understanding of electric machines play to provide the students or FEM will be developed and provide the students or FEM will be develope	Sizing of communications networks  Distributed Artificial Intelligence 3/24 the course runs for the last time. In future years, it will not be opened anymore. Distributed problem solving. Multiagent pla runcication strategies, message passing. Various AI approaches, case studies. Types of agent behavior. Negotiation. Organiza systems. Client-server systems. Peer-to-peer systems. Implementation aspects of distributed knowledge-based systems. Lear equitance models, social knowledge, reflectivity in MAS. Coalition formation, team work. Formal models of agent architecture.  Distributed Systems anisms - message exchange, procedural communication (RPC, ORB), distributed shared memory. Process algebras - CSP, C distributed execution, global state, causality, logical time. Algorithms of: exclusive access, leader election, deadlock detection/forthms, replication. Mobility, search in distributed systems - DHT.  Distributed Systems anisms - message exchange, procedural communication (RPC, ORB), distributed shared memory. Process algebras - CSP, C distributed execution, global state, causality, logical time. Algorithms of: exclusive access, leader election, deadlock detection/forthms, replication. Mobility, search in distributed systems - DHT.  Satellite communication and navigation systems and - overview. Systems for fixed and mobile service. Satellite networks: Intelsat, Eutelsat, Inmarsat, Intersputnik, Astra. Orbits (communication channel. Energetic budget of satellite link. Satellite link design. Frequency bands. Modulations and multiplexes: on. Systems VSAT, DAMA, DVB-S, S-UMTS. Multimedia satellite services. Satellite navigation systems: GPS, GLONASS and is integration - CNS systems.  Dynamics of Electric Machines ic machine general theory. Mathematical transformation systems, per unit system. Mathematical model of DC machine, of syric tectro-dynamic transient phenomena in electric machines. Short-circuit. Switching of the motor on the network. Electromagne cillation. Circle diagram methods for transient effect solv	ZK ZK anning. Cooperational structuring. Cooperational structuring. Ining in multiagent ZK CS, and pi-calculur prevention, termin ZK CS, and pi-calculur prevention, termin Z,ZK CS, and pi-calculur prevention, termin Z,ZK LEO, MEO, GEO TDMA, FDMA an GALILEO. Satellite ZK Inchronous and increase and incre	4 4 on. Coordinatior Partial global systems.  4 us, cooperating ation. Faults,  4 of the Course is space phasors hines). Thoroug ic machines.
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XP32DKS XP33DID In winter semester 202 Communication. Comit planning. Blackboard of Meta-agent. Agents and Meta-agent agent	Sizing of communications networks  Distributed Artificial Intelligence 3/24 the course runs for the last time. In future years, it will not be opened anymore. Distributed problem solving. Multiagent pla nunication strategies, message passing. Various AI approaches, case studies. Types of agent behavior. Negotiation. Organizarystems. Client-server systems. Peer-to-peer systems. Implementation aspects of distributed knowledge-based systems. Lear quitance models, social knowledge, reflectivity in MAS. Coalition formation, team work. Formal models of agent architecture.  Distributed Systems anisms - message exchange, procedural communication (RPC, ORB), distributed shared memory. Process algebras - CSP, C Distributed execution, global state, causality, logical time. Algorithms of: exclusive access, leader election, deadlock detection/porithms, replication. Mobility, search in distributed systems - DHT.  Distributed Systems anisms - message exchange, procedural communication (RPC, ORB), distributed shared memory. Process algebras - CSP, C Distributed execution, global state, causality, logical time. Algorithms of: exclusive access, leader election, deadlock detection/porithms, replication. Mobility, search in distributed systems - DHT.  Satellite communication and navigation systems in - overview. Systems for fixed and mobile service. Satellite networks: Intelsat, Eutelsat, Inmarsat, Intersputnik, Astra. Orbits (communication channel. Energetic budget of satellite link. Satellite link design. Frequency bands. Modulations and multiplexes: on. Systems VSAT, DAMA, DVB-S, S-UMTS. Multimedia satellite services. Satellite navigation systems: GPS, GLONASS and is integration - CNS systems.  Dynamics of Electric Machines in machines general theory. Mathematical transformation systems, per unit system. Mathematical model of DC machine, of syrilectro-dynamic transient phenomena in electric machines, Short-circuit. Switching of the motor on the network. Electromagne cililation. Circle diagram methods for transient effect solves	ZK ZK anning. Cooperational structuring. Ining in multiagent ZK CS, and pi-calculur prevention, termin ZK CS, and pi-calculur prevention, termin Z,ZK CS, and pi-calculur prevention, termin Z,ZK LEO, MEO, GEO TDMA, FDMA an GALILEO. Satellite ZK Inchronous and increase in the course of synchronous mace struction of electric arkets. These are a course, students haring, re-dispatce	4 4 on. Coordination Partial global systems.  4 us, cooperating ation. Faults,  4 of the CDMA. Spread e communication  4 duction machine, components.  4 of the course is space phasors hines). Thorough ic machines.  4 two main groups will learn how to th. It is also about

XP01EAL	Effect algebras	ZK	4
XP01EKM	algebras. Effect algebras, MV-effect algebras, various types of elements, compatibility, partitions, states.  Mathematics Models for Economics	ZK	4
-	oduction to the theory of time series and random processes used in economics for describing values (financial assets, produ	1	ss) randomly
	Il be shown. Further, the terms of stochastic differential and stochastic integral are introduced.	71/	4
XP16ERU Principles of account	Accounting ing. International accounting standards (IFRS). Methodology of accounting. Cost, revenues, profit and cash flow. Balance she	ZK eet profit and loss a	4
of company's financia		set, profit and 1000 at	oodin. 7 mary
XP16EKO	Economics	ZK	4
	s. Principles of microeconomics, consumer behaviour and producer behaviour. Profit maximization. Perfectly competitive mar		
· ·	conomics, aggregate demand and aggregate supply. Labour market. Money market and capital market. Macroeconomic polic tting the market. Comment: The subject is a necessary precondition for understanding other economic and managerial discip	-	as a factor
XP16MES	Economics and Management of Energy Systems	ZK	4
	f electric power sector, gas systems and central heating systems functions. Marginal revenue in electric power system. Margi	1	ty, heat and g
-	nization, subsystem and system optimization in generation and transportation of different kinds of energy. Reliability in energ	y delivery. Internatio	nal cooperation
n power industry. En XP16EME	ergy price regulation and its consequences  Economics and Management of Energetics	ZK	4
-	Economics and Management of Energetics ure of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and tar		
•	of international cooperation in power industry and its economic and ecology aspects.		
XP16MEU	Economics and Management of Energetics	ZK	4
	ure of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and tar	riffs of energy. Gover	nmental ener
XP16EPM	of international cooperation in power industry and its economic and ecology aspects.	ZK	4
-	Economics of power markets basic theoretical knowledge about the organization and functioning of electricity markets. The starting point is the theory of s	1 1	
	f the electricity supply curve. This is followed by the theory of integration of electricity markets and the creation of economic we	ŭ	•
-	end to decarbonise and integrate electricity markets. This, together with the massive rise in electricity from intermittent source		
	city markets and new business models including demand response and the development of the prosumers concept (where e		-
KP16ERE	). Part of the subject is also discussion of other links of the electricity market - emission allowances, connection to the heat m Economics of power generation from RES	ZK	4
-	on complex problems of economy of production of electricity and heat from renewable energy sources. The course develops		-
-	nent due to the specifics of electricity / heat generation from RES and the expected development of energy markets. Consequ	•	-
•	ricity market, taking into account current trends in the decentralization of energy systems, decarbonisation of energy and the ex		
	ectricity market. These trends require the development of different types of energy accumulation and the implementation of sm . The course also includes modeling of the development of energy systems with high RES share.	nart technologies in t	he managem
XP37ELA	Elastoacoustics	ZK	4
_	h interactions of elastic structures with gaseous medium, namely vibrations of plates, radiation impedances, modal equations		-
	element method, calculation of eigenfrequencies.		
XP15ES	Electrical Lighting	Z,ZK	4
	sses. Light micro climate design. Daylight, artificial and mixed lighting. Visual performance. Visual comfort. Colorimetry. Light terior and interior lighting. Lumen method. Integrated and remote controlled lighting systems.	sources. Luminaire	characteristics
XP15ET	Electroheat	Z,ZK	4
	lamental equations of heat and mass transfer in electromagnetic field in continuum. Thermal effects of electromagnetic field.	1 '	-
	and arc heating. Similarity and analogy of equations and their use. Numerical methods in electroheat.		
XP02EVA	Physics for Electroenergetics	ZK	4
	cted parts of physics for students of electric power engineering: Physical principles of gas discharges - glow, arc, spark and corc e acquainted with characteristics for magnetized, astrophysical and fusion energy generation. A part of the course is two excur-	ŭ	
Academy of Science:		Sions in laboratories	010 4114 020
XP34ETS	Electrical Transport in Semiconductors	ZK	4
	nsport in semiconductor crystals. Effective mass, mobility Boltzmann's transport equation. Scatter mechanisms, frequency. Scatt	• •	•
•	elaxation time approximation Carrier transport in a strong electric field, velocity saturation. Carrier transport in magnetic field. transport, density matrix, Green's and Wigner's functions. Resonance tunnelling, transport of electrons in superlattices. Singl	•	
	nsport, Quantum Hall's effect. Simulation of transport effects.	e electron transport,	Coulonibs
KP17ELD	Electrodynamics	ZK	4
XP14EMC	Electromagnetic Compatibility	ZK	4
	Interference coupling. Shielding. Earthing. Nonlinear consumers. Harmonics in electric convertors in steady and transient co	onditions. Supression	of negative
	on the network. Compensation and filtration.	71.	
XP14ECD	Electromagnetic Compatibility  Different manner and coupling factors of interference spreading. Grounding influences. Screening. Non-linear electric applian	ZK	4
	orms of different electric appliances. Harmonic current and voltage components of different electric appliances. Steady state	· · · · · · · · · · · · · · · · · · ·	
_	nts. Interference suppression of converters on the network. Compensation and filtration substations.		· ·
/DOOFING	Electromagnetic Compatibility of Data Acquisition Systems	ZK	4
	Measurement of electromagnetic emission and immission. EMC standards. Modelling of disturbing signals. Electromagnetic dis	sturbance in laborate	ory and indus
EMC - basic terms. N	ms with regard to EMC. EMC of data transmitting lines.	フフレ	1
EMC - basic terms. N Design of DAQ syste	Engrav Economy	Z,ZK	4 Energy balan
EMC - basic terms. N Design of DAQ syste XP15EH	Energy Economy try of national economy Terminology of energy economy The energy systems. Forecast of energy consumption Energy balance	e in production field	
EMC - basic terms. N Design of DAQ syste XP15EH Energy economy, par	Energy Economy rt of national economy. Terminology of energy economy. The energy systems. Forecast of energy consumption. Energy balance economy and its impact to environment. Energy economy on the organization level. The control of energy economy. Basic prol	-	
EMC - basic terms. N Design of DAQ syste XP15EH Energy economy, par n buildings. Energy e	rt of national economy. Terminology of energy economy. The energy systems. Forecast of energy consumption. Energy balance	-	
Design of DAQ syste XP15EH Energy economy, par in buildings. Energy e XP15EZP Overview of envirome	rt of national economy.Terminology of energy economy.The energy systems. Forecast of energy consumption.Energy balance economy and its impact to environment. Energy economy on the organization level.The control of energy economy. Basic prol	Z,ZK act of nuclear power	cy. 4 plants.Impac
EMC - basic terms. No Design of DAQ system XP15EH Energy economy, pain buildings. Energy eXP15EZP Overview of environments.	rt of national economy. Terminology of energy economy. The energy systems. Forecast of energy consumption. Energy balance economy and its impact to environment. Energy economy on the organization level. The control of energy economy. Basic proluce Control in Power Engineering ental problems. The role of power engineering. Global climate change. The greenhouse effect. Carbon dioxide emissions. Impact. Renewable energy sources. Methods and technology for decreasing of impact to environment. Electric power transmission as	Z,ZK act of nuclear power	cy. 4 plants.Impac

XP33ECD	Evalutionary Computing	ZK	4
	Evolutionary Computing  Properties of the Computing State of the State	l .	-
	tive phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typica		
GA and GP applications	s. Special methods for improving GA performance.		
XP15EXE	Expert Systems in Electrical Power Engineering	Z,ZK	4
	aluation. Expert systems in electrical power engineering and diagnostics of insulating systems. Application of rule-based exp	-	neural networks
	neering and diagnostics of insulating systems. Creation of expert systems for electrical power engineering and electro diagno		
XP16FVT	Philosophical Problems of Science and Technology	ZK	2
	in the evolution of principal ideas on which the science and technology are founded. Philosophical aspects of physics and matthe so called "Postmodernism" and to the alternative ways of understanding and their social coherences are discussed.	amemancs are de	eper examined.
XP16FIM	Financial Management	ZK	4
	esent value and alternative cost of capital, net present value, present value of bonds and stocks, investment decision making	l .	
alternative cost of capital	al, risk and return, lease or buy decision, inflation and return, real options, financial options, option valuation, hedging, short t	term finance, cash	flow finance.
XP31FSK	Phonetic signals and their coding	ZK	4
-	the processing of speech signals. Within the subject students should manage from basic to advanced and modern algorithms		
_	Further reasonable part is focused on speech recognition, where students will get to know modern and advanced technique in peaker recognition. Special attention is devoted to usage of classification techniques based on GMM, DTW, HMM, ANN/DNN		
XP31FON	Speech Phonetics and Advanced Voice Technologies	ZK	
XP15FAK	Photometry and Colorimetry	Z,ZK	4 4
	rnotometry and Colomnetry: methods. Standards of luminance and luminous flux. Receivers of radiation and modification of their characteristics. Photom	1 ' 1	
1 ' '	Luminaire parameters. Measuring of indoor lighting systems. Measuring of outdoor luminance and illuminance. Colour vision		
Colorimeter space. Colo	our rendering-index. Chromaticity system.Diagram of chromatic. Colorimeter. Spectroscop		
XP37FOS	Photonic Imaging Systems	ZK	4
	tation. Energetic image description. Principles of image acquisition, transferring and storing. Image entropy function, 2 dimensional transferring and storing.		
	iption. Novel compression techniques. Image reproduction, matrix description. Light diffraction. 2D transfer functions - PSF, M ransfer systems and their signal distortion, image aberration and their correction, toleration analysis of optical system. Receiv		
1	iansier systems and their signal distortion, image aberration and their correction, toleration analysis of optical system. Receiv ocessors, computers and memories.	vers and transmit	ers for special
XP13FCD	Photovoltaics systems	Z,ZK	4
	ne most important problems of principle, technology of production and final use of photovoltaic systems for power generation		ergy and basic
	. Photovoltaic effect, photovoltaic cells. Optimization of cell structure in terms of optical and electrical properties of individual		
	mination of the maximum theoretically achievable energy conversion efficiency of a given structure. Photovoltaic modules. Tech		
1	oltaic cells and modules. Characterization and diagnostic methods, analysis of failure types, influence on durability. Photovoltaic is of photovoltaic systems. Simulation of yield for a given type of climate and season. Trends in applications of photovoltaic sy		
XP04F1ZK	French language 1	ZK	0
XP04F1ZR XP04F1	French language 1	NIC	0
_	mmar and vocabulary, with the emphasis on technical style ; ability to understand technical texts on an intermediate level ( te		ca 60 pages of
texts). Oral presentation	is - ability to talk on subjects studied by the postgraduate student. Writing cover letters, CV, answering advertisements etc.		
texts). Oral presentation XP04F2ZK	is - ability to talk on subjects studied by the postgraduate student. Writing cover letters , CV, answering advertisements etc.  French language 2	ZK	0
		ZK NIC	0
XP04F2ZK XP04F2 Very good proficiency b	French language 2 French language 2 oth in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult	NIC text, reading com	prehension of
XP04F2ZK XP04F2 Very good proficiency b texts (cca 120 pages). C	French language 2 French language 2 oth in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by possible or content level studied by cont	NIC text, reading com	prehension of
XP04F2ZK XP04F2 Very good proficiency b texts (cca 120 pages). C skills related to job appl	French language 2 French language 2 oth in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by polications, cover letters etc.	NIC text, reading com ostgraduates). Mas	prehension of stering language
XP04F2ZK XP04F2 Very good proficiency b texts (cca 120 pages). C skills related to job appl XP01FA1	French language 2 French language 2 oth in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by polications, cover letters etc.  Functional Analysis 1	NIC text, reading com	prehension of
XP04F2ZK XP04F2 Very good proficiency b texts (cca 120 pages). C skills related to job appl XP01FA1 Measure theory and Le	French language 2 French language 2 oth in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by polications, cover letters etc.  Functional Analysis 1 besgue integral. An introduction to Hilbert spaces. Theory of linear operators in Hilbert spaces. Spectral theory.	NIC text, reading com ostgraduates). Mas	prehension of stering language
XP04F2ZK XP04F2 Very good proficiency b texts (cca 120 pages). C skills related to job appl XP01FA1 Measure theory and Le XEP33FLO	French language 2 French language 2 oth in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by polications, cover letters etc.  Functional Analysis 1	NIC text, reading com ostgraduates). Mas	prehension of stering language
XP04F2ZK XP04F2 Very good proficiency b texts (cca 120 pages). C skills related to job appl XP01FA1 Measure theory and Le XEP33FLO	French language 2 French language 2 oth in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by polications, cover letters etc.  Functional Analysis 1 besgue integral. An introduction to Hilbert spaces. Theory of linear operators in Hilbert spaces. Spectral theory.  Fuzzy Logic	NIC text, reading com ostgraduates). Mas	prehension of stering language
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XP04F2ZK XP04F2 Very good proficiency b texts (cca 120 pages). C skills related to job appl XP01FA1 Measure theory and Le XEP33FLO Basics of fuzzy sets and XP33FLO Basics of fuzzy sets and XP35FMD	French language 2  The changuage and content level studied by position of the changuage and content level studied by	NIC text, reading com stgraduates). Mas  ZK  ZK  ZK  ZK  ZK	prehension of stering language  4  4  4  4
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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,
	, 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
XP33GAD	tudied. Finally, simple and advanced methods of biosignals pre-processing, analysis and evaluation are presented for each t Geometrical Algebras	ZK	4
	d in geometry: Groups and linear spaces, ordered groups and fields, othogonal groups, Clifford algebras, etc. Discussion of	1	•
processing.	a in geometry. Groupe and ineal operator, or across groupe and notary emegania groupe, emistra argustics, etc. 2 isotation or	poterma applica	
XEP33GMM	Graphical Markov Models	ZK	4
	n WS 2023/24 for the last time. It will not be opened anymore. Markov models on graphs represent a model class widely app		
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
XP16HKA XP16HDS XP16HEL XP16HIS XP02HS Sound field, noise and w	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	ZK NIC ZK ZK	2 2 4 4
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 mig environment. 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 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 optics application. XP12IMM Review methods solution of vectorial and analytical analytical and analytical and analytical and analytical and analytical ana	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 Bibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise mage environment. 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 co- ity 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. Ho ation system projects from the point of view of medicine. Introduced hospital information systems. Diagnosis theory, computer a cation in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in ne planning. 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 differer er and Laplace transforms of distributions. Linear dynamic systems, causality, passivity, convolution. Systems with bounded spe- linearity Laplace transforms of distributions. Linear dynamic systems, causality, passivity, convolution. Systems with bounded spe- linearity Laplac	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 antic and inter  ZK antic and inter  ZK antic equations. Interprete of the conductor integrate of the conductor integra	2 2 4 4 4 s and types of  4 regineering, main  4 recessors with malisation  4 resystems. recovered by a systems. recovered by a systems. The systems and difference  4 reduction to meand difference  4 resystems and integrated  4 h using methods
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 inversal and signal processors) and with support hardware accelerators in FPGA circuits. Optimization of the algorithm is con- by 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 attoin system projects from the point of view of medicine. Introduced hospital information systems. Diagnosis theory, computer a attoin in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in melanning. 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 and Laplace transforms of distributions. Linear dynamic systems, causality, passivity, convolution. Systems with bounded special and preparation of dielectric and polymer waveguides and structures. Optical waveguide gratings. Passive waveguide  Design and preparation of dielectri	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 wit 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 ibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise m ge environment. 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- y 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 medicine. Introduced hospital information systems. Diagnosis theory, computer a- tation in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in neglanning. 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 in communication between information systems in medicine. Specialized computer networks.  Integral Transforms and Z Iransform are found to several proper structure design. Waveguide coupling elements. Gratings structures at waveguide pesign and prepar	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 wit 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 more		
	ents of the course are fundamental results (principles) of nowadays mathematics. More specifically, the course concerns the opplied 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 applied)		•
	ls 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
<u>.</u>	exity of algorithms. P and NP problems and their solutions: exact solutions, heuristics, approximation schemes, probabilistic alg		•
XP36KP	Communication Protocols  of principles, SDL language, protocol architecture: ISO OSI, error control, data-link layer protocols: X.25, higher layer protocols	ZK	4 municating finite
•	nentation tools (FSM language ESTELLE, regular grammars), use of Petri nets, specification language LOTOS, protocol trans		_
validation and verificati		, <b>.</b>	, ., ,
XP35CCM1	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 system	ms are considered	d composed of
=	ns, with local computation and communication capabilities. The broad aim is solving classical problems e.g. stabilization, track	-	•
	n 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 Theory: Review of qualitative properties of dynamical systems, Motivation for distributed multi-agent systems, Elements of al-		
	Consensus and synchronization of linear/nonlinear, continuous/discrete-time systems, Cooperative stability, optimality and rol		•
	ry, Interactions with environment.		·
XP34CNO	Integrated Optics	ZK	4
	ogical principles of IO Basic materials for IO. Light propagation in waveguide structures. Methods of waveguide structure design	_	
	uctures. Modal spectroscopy. Fundamental physical effects and interactions for IO. Preparation of dielectric waveguides and s		waveguide
<u>.</u>	cal modulators. Applicable measurement methods. Devices based on nonlinear effects. Semiconductor integrated opto-electrons and the control of the control o		
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		-
	n the general linear model and knowledge how to deal with basic model and data deficiencies, simultaneous systems, and sir		
-	oing theoretical topics covered in the essential courses on Econometrics. The course will follow with different empirical research		
Each project will be into	oduced by the relevant economic theory-model. Using own and empirical data sets, the students will apply standard economic	etrics methods to	answer basic
•	xercise sessions will provide introduction into advance use of statistical packages (best is TSP or Stata or their derivatives like	E-views) and a f	eedback on
	oblem sets. The course will require intensive work with data and statistical packages.	717	
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 model 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		
<del>-</del>	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.	Overetitative December Matheda in Management	71/	4
XP16KVM	Quantitative Research Methods in Management SPSS for advanced statistical methods as multiple regression and correlation, analysis of variance, factor analysis, cluster ar	ZK	4
research and manager		iarysis and its usi	ig in marketing
XP01KVP	Quantum Computing	ZK	4
	presents a new programming paradigm. The safety of nowadays encypering techniques is based on enormous computation co		
problems. This safety n	nay 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
design fast factorization	n 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. Calculation		-
	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.	onai treatment. No	n-invasive
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		=
	ool 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
systems; design of fixe	d-order robust controllers with H-infinity specifications. For more information, see http://www.laas.fr/~henrion/courses/lmi		
XP35LMI1	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		
•	ool 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		-
	d-order robust controllers with H-infinity specifications. For more information, see http://www.laas.fr/~henrion/courses/lmi Výsl	=	
-	rut.cz/anketa/aktualni/courses/XP35LMI		р с та
XP35LSD	Linear Systems	ZK	4
This course builds upor	the master program lectures on Dynamical Systems Theory. The structure and properties of linear multi-input multi-output sys		The significance
of these results for the	design of linear controls is demonstrated. The presentation focuses on pole placement techniques, linear state regulation and	l estimation, and l	_QG control
- :	d transfer-function design techniques are compared. The lectures are supported by laboratory experiments using Matlab, Contro	ol System Toolbox	, and Polynomial
Toolbox.	Logical Simulation	71/	A
XP36LSM General introduction to	Logical Simulation simulation   Logical Simulation systems, synchronous and asynchronous simulation. Simulation systems	ZK	4
-	ypes, 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.		
-	ypes, entities, architectures, sequential environment (processes, functions, procedures), signals and their attributes, resolution		

XP33LPD	Literate and Literate Decomposition	71/	4
I Mathematical logics an	Logic and Logic Programming disciplines. Formal system and its essential properties - validity, completeness. Syntax and semantic	ZK cs. basic definition	4 ns. Compactness
	guage and its interpretation. Theory and its model, Herbrand's model. Herbrand's theorem, Gödel's completeness theorem		•
l	and probability. Logic programming and Prolog language. Metodology of logic programming. Introduction of extralogical feature	-	ates. New trends
	Imming (CLP)and inductive logic programming (ILP). Some practical examples of complex logic programs and practical applications of the complex logic programs and practical applications.		
XP38MPX	Magnetism in Engineering Practice	ZK	4
	ced into the magnetic materials, magnetic sensors and engineering magnetism including FEM design and magnetic measure an be modified according to the students´ needs.	ements and testing	g. The content of
XP02MHD	Magnetohydrodynamics	ZK	4
_	of the behaviour of hot plasma in magnetic fields		•
XP16MAN	Management	ZK	4
Principles of managem	ent and its innovation, modern ways of management, responsibility of managers, manager's ethics, successful manager thinl	king and behaviou	ir.
XP16MAV	Production Management	ZK	4
	process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning w	ith respect to proc	luction typology.
	production management, standardization. Controlling, production management methods.	71/	4
XP33MZT	Management of Knowledge and Information Technologies the design of knowledge-based and information systems. Configuration of information systems. User interfaces, especially co	ZK	Problem solving
'	of the problem solving processes based on description of the workflows. Simplification of the processes by the support of IT (Pro	-	-
I	nd tools for modelling. IT applications in enterpreneurship as well as in the project management. Business Intelligence. Value	_	-
manufacturers and cus	tomers. E-commerce. Role of knowledge in globalization of businesses. Virtual enterprises and organizations.		
XP16MAU	Accounting for management	ZK	4
	gerial accounting. Relations to the organisational structure of the enterprise and to the production process. Budgets, use for m	anagement. Calc	ulations and cos
	and measurement of productivity in the production process. The managerial information systems.	71/	
XP16MAR	Marketing of the marketing management. Marketing research and marketing information system. Concepts of marketing strategy. The uso	ZK	4
	in the marketing management, Marketing research and marketing miormation system. Concepts of marketing strategy, The usi licy, pricing and contractation policy, communication, distribution. Marketing mix.	e or product life cy	cie and portiono
XP16MAS	Marketing Strategies	ZK	4
	owledge of marketing. The analysis of marketing strategies in different market situations. The firm's behavior under competiti	I	
Case studies in the fiel	d of product policy, price and condition policy, communication policy and distribution policy.		_
XP33MAD	Mathematical Analysis of Dempster-Shafer Theory	ZK	2
	(DST) presents a model for uncertainty quantification and processing in knowledge-based systems. The belief function, which i		
	d and investigated in this theory, can be taken as a generalization of probability measure. The model of DST will be presented		•
· ·	s well as to the case when only a fragment of the outcoming knowledge demanded by the classical DST is at our disposal. Be alues will be also briefly mentioned. The intended goal of the course is to offer a solid basis for the practical and critical applic		_
· ·	vard decision making under uncertainty.		various noids of
XP01MST	Mathematical Statistics	ZK	4
Random sampling, ord	ered sampling and their distributions. Sample statistics. Point estimates and interval estimates. Confidence intervals. Estimatic	ons, unbiased and	consistent
estimates Hypothesis	acting for distribution parameters. Hunothesis testing for equality of parameters. Napparametric tests. Pagraggian analysis		
	esting for distribution parameters. Hypothesis testing for equality of parameters. Nonparametric tests. Regression analysis.		
XP01MTS	Mathematical Methods in Signal Theory	ZK	4
XP01MTS Continuous, discrete, p		I	
XP01MTS Continuous, discrete, p Analytic signals.	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and	Shannon-Kotelnik	ov. Modulation.
XP01MTS Continuous, discrete, p Analytic signals. XP01MKR	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and Mathematics for cryptography	I	
XP01MTS Continuous, discrete, p Analytic signals. XP01MKR Introduction to the theo	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and  Mathematics for cryptography ry of groups, finite fields, and polynomials over finite fields and their applications in cryptography.	Shannon-Kotelnik	ov. Modulation.
XP01MTS Continuous, discrete, p Analytic signals. XP01MKR Introduction to the theo XP33MKD	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and Mathematics for cryptography	Shannon-Kotelnik  ZK  ZK	ov. Modulation.
XP01MTS Continuous, discrete, p Analytic signals. XP01MKR Introduction to the theo XP33MKD Overview of modern managements	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and  Mathematics for cryptography ry of groups, finite fields, and polynomials over finite fields and their applications in cryptography.  Mathematics for Cybernetics - Selected Topics	Shannon-Kotelnik  ZK  ZK  int theorem with a	ov. Modulation.  4  4  pplications,
XP01MTS Continuous, discrete, p Analytic signals. XP01MKR Introduction to the theo XP33MKD Overview of modern m fractals. Linear spaces, Tensor product. Element	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and Mathematics for cryptography ry of groups, finite fields, and polynomials over finite fields and their applications in cryptography.  Mathematics for Cybernetics - Selected Topics athematics. 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 stary theory of Hilbert spaces. Introduction to category theory.	ZK  ZK  int theorem with a and singular value	4  4  pplications, e decomposition
XP01MTS Continuous, discrete, p Analytic signals. XP01MKR Introduction to the theo XP33MKD Overview of modern m fractals. Linear spaces, Tensor product. Element XP34MTP	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and Image:  Mathematics for cryptography ry of groups, finite fields, and polynomials over finite fields and their applications in cryptography.  Mathematics for Cybernetics - Selected Topics athematics. 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 intervity theory of Hilbert spaces. Introduction to category theory.  Materials and Technologies for Photonic Devices and Structures	Shannon-Kotelnik  ZK  ZK  int theorem with a and singular value  ZK	ov. Modulation.  4  4  pplications, e decomposition
XP01MTS Continuous, discrete, p Analytic signals. XP01MKR Introduction to the theo XP33MKD Overview of modern m fractals. Linear spaces, Tensor product. Element XP34MTP The students get acqua	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and in Mathematics for cryptography ry of groups, finite fields, and polynomials over finite fields and their applications in cryptography.  Mathematics for Cybernetics - Selected Topics athematics. 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 interly theory of Hilbert spaces. Introduction to category theory.  Materials and Technologies for Photonic Devices and Structures inted with optical materials such as semiconductors, optical glass, crystals, and polymers. The students get acquainted also we	Shannon-Kotelnik  ZK  ZK  int theorem with a and singular value  ZK  with technologies for	ov. Modulation.  4  4  pplications, e decomposition  3 or the fabricatior
XP01MTS Continuous, discrete, p Analytic signals. XP01MKR Introduction to the theo XP33MKD Overview of modern m fractals. Linear spaces, Tensor product. Element XP34MTP The students get acqua of optical and optoelect	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and Image:  Mathematics for cryptography ry of groups, finite fields, and polynomials over finite fields and their applications in cryptography.  Mathematics for Cybernetics - Selected Topics athematics. 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 intervity theory of Hilbert spaces. Introduction to category theory.  Materials and Technologies for Photonic Devices and Structures inted with optical materials such as semiconductors, optical glass, crystals, and polymers. The students get acquainted also we ronic devices and structures. It will be present technologies for deposition of the micro and nano layers deposition. Students	Shannon-Kotelnik  ZK  ZK  int theorem with a and singular value  ZK  with technologies fewill be introduced	ov. Modulation.  4  4  pplications, e decomposition  3 or the fabricatior to new modern
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XP01MTS Continuous, discrete, p Analytic signals.  XP01MKR Introduction to the theo XP33MKD Overview of modern m fractals. Linear spaces, Tensor product. Element XP34MTP The students get acquate of optical and optoelect technologies and it will the measurement of the XP01MTP Similar matrices. Jordan exponential matrix. Symmatrix. Generalized sol XP15MPE Basic model modules, n XP38MMN Physical principles of s detectors, detection of Sensor design and tech XP15MVN Types of testing voltage types of dividers. Divide instruments for measur current on potential by XP37MVP Targeting and motivation	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and series and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and series and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and series and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and series and series. It series and seri	ZK  ZK  int theorem with a and singular value  ZK  with technologies fivility be introduced between and diagnost the control on Moore-Penros  Z,ZK  d and power factor  ZK  d analyzers, biosecurity and military  Z,ZK  se voltages by volte leasurement of AC Rogowski coil. Med  ZK  preparation, exam	ov. Modulation.  4  4  Applications, e decomposition to new modern stic methods for 4  compensatores 5  compensatores 6  dense 7  compensatores 7  dense 8  compensatores 8  dense 9  compensatores 9  dense 9  dens
XP01MTS Continuous, discrete, p Analytic signals.  XP01MKR Introduction to the theo XP33MKD Overview of modern m fractals. Linear spaces, Tensor product. Element XP34MTP The students get acquate of optical and optoelect technologies and it will the measurement of the XP01MTP Similar matrices. Jordan exponential matrix. Symmatrix. Generalized sol XP15MPE Basic model modules, n XP38MMN Physical principles of s detectors, detection of Sensor design and tech XP15MVN Types of testing voltage types of dividers. Divide instruments for measur current on potential by XP37MVP Targeting and motivation	Mathematical Methods in Signal Theory eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and signals and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and signals and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and signals and signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and signals and their applications in cryptography.  Mathematics for Cybernetics - Selected Topics athematics. Ordering, lattices, Boolean algebras, representations. Topological spaces. Metric spaces, completeness, fixed-po constructions with linear spaces. Introduction to category theory.  Materials and Technologies for Photonic Devices and Structures inted with optical materials such as semiconductors, optical glass, crystals, and polymers. The students get acquainted also we ronic devices and structures. It will be present technologies for deposition of the micro and nano layers deposition. Students be shown principles of integrated optoelectronic devices and structures. It will be also shown the design of the photonic struction optical and optoelectronic properties.  Matrix Calculus  Tolicks, Jordan canonical matrices. Real canonical form of a real matrix. Characteristic and minimal polynomial. Caley-Hamiltothetic, orthogonal and positive matrices. Diagonalization of symetric, positive and circulant matrices. Singular value decompositivation of systems of linear equations.  Mechatronics in Electrical Power Engineering  Mechatronics in Electrical Power Engineering  Mechatronics in Securical Power Engineering  Measurement of Nonelectric Quantities  Physical processing in sensor systems, intelligent sensors.  High Voltage Measurement  High Voltage Measurement  High Voltage Measurement  High Voltage Measurement of temperature, pressure, flow, movement, position and other physical quantities. Chemical se	ZK  ZK  int theorem with a and singular value  ZK  with technologies fivility be introduced between and diagnost the control on Moore-Penros  Z,ZK  d and power factor  ZK  d analyzers, biosecurity and military  Z,ZK  se voltages by volte leasurement of AC Rogowski coil. Med  ZK  preparation, exam	ov. Modulation.  4  4  Applications, e decomposition to new modern stic methods for 4  compensatores 5  compensatores 6  dense 7  compensatores 7  dense 8  compensatores 8  dense 9  compensatores 9  dense 9  dens

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 basis and the second of the second o		
	on methods: spectral domain, integration equation, finite differences, finite elements, mode matching, transversal resonance. In method, disturbance method.	Survey of basic tr	eorems or
XP38MDR	Methods of Signals Digitalization and Reconstruction	ZK	4
	onventional methods of analog preprocessing of typical sensors signals, selection of optimal digitization methods and optimization		•
•	rement results to achieve high accuracy and effective suppression of disturbing signals.	non or naraware e	oration morating
XP38MPM	Methods for Precision Measurement of Electrical Quantities and Measurement Data Processing	ZK	4
	lectrical quantities. Collective standards. Inductive ratio devices for precision electrical measurements and possibilities of improv		•
	ecision measurement of active and passive electrical quantities. Evaluation of measurement errors and uncertainties. Metrolo	-	
of measurement data.			
XP38MET	Metrology	ZK	3
	n solving problems connected with the metrology of electrical quantities and application of modern tools to it. The lectures acq	uaint students wi	h the up-to-date
	surement of electrical quantities with an accent to correct evaluation of accuracy.		
XP14MID	Microprocessor Control of Electric Drives	ZK	4
· · · · · · · · · · · · · · · · · · ·	r architecture. ADC, DAC special circuits, DMA, measurement of pulse parameters. Event memories, FIFOs, CAMs, multiport		
· ·	ocessor concept, fast computing, interface issues. Parallel information processing. Multiprocessor systems. Real-time system e driven systems, F/B systems. Interrupt driven system, full featured kernels. Tasks, intertask communication, queues, sema	-	•
and issues. SW, HW de		priores. Control al	gontinins design
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, multiproces	· ·	
RT systems, preemptive	RTOS, tasks, queues, semaphors, critical section, control computer programming methods, control computer resources appli	ication in scalar a	nd vector control
of electric drives.			
XP14MIR	Microprocessor Control of Electric Drives	ZK	3
· · · · · · · · · · · · · · · · · · ·	I signal processor (DSP), digital signal microcontroller (DSC), architecture, computational resources, fixed point, fraction, float		
=	special blocks, ADC, event memory, FIFO, CAM, Multiport RAM, impulse signal generation, serial communication, methods, I	· ·	•
•	, 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	ZK	4
•	and classification of microsystems. Micro-sensors. Micro-actuators. Signal processing within the system. MEMS (micro-electric structures). MEMOS (micro-electrical-mechanical-optical structures). Microsystem design. Microsystem modelling. Manufact		<i>'</i>
Industrial applications.		aring teerinologie.	s. Materials.
XP34MSA	Microsystems and Microactuators	ZK	3
	ystem integration applied in the design of digital and analog systems with application of system engineering, in i tis solved in		-
	ms on a chip as well as external. The course shows new possibilities of realization and application of integrated micro-compon		* * *
principles and quantities	s using mainly MEMS technology, increasing reliability with all its attributes. The course introduces modern elements - microa	ctuators with vari	ous principles of
their activities including	basic applications in industry, medicine, regulation, automotive control, etc. Basic elements of nanotechnology and nanoelec	tronic structures	are mentioned
here. The subject extend	ds students' expertise with the latest multidisciplinary chip elements and their wide use in information technologies, IoT, biom	edicine, aerospad	e, automotive
industry etc.			
XP17MT	Microwave Technique	ZK	. 4
	lines and its circuit elements including hybrid and monolithic integrated circuits technology. Resonators and other type of parallel to a solution of the circuits technology.		
CAD of microwave circu	olators and circulators, modulators etc.) and active microwave circuits (e.g. oscillators, mixers and amplifiers), microwave filte	ers, microwave m	easurement.
XP32MOS	Mobile Networks	ZK	4
	students with evolution and standardization of mobile networks and mainly provides a detailed description of network architectu		•
	s. The course as well depicts trends and the future development of mobile networks.	100 and dioddood	baolo principioo
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		
knowledge. Correspond	ence 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
Program tools of compu	ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap	hic edited system	s and examples
_	of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Example 1.00 power semiconductor systems.	mples of simulation	ns. Modelling of
	mechanical systems, hydraulic systems and thermal systems. Examples of simulations.		
XP33ICT	Modern ICT for Industry and Smart Grids	ZK	4
XP02MPF		Z,ZK	2
XP14RPD	Advanced Controlled Drives	ZK	3
	requency feeding. Current source converter. Voltage source converter, PWM, Electromagnetic torque by feeding from freque	-	
·	nd 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
-	cal 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, oper	ation, principles,
applications			
XP14MZR	New Control Methods for Electric Drives	ZK	4
	to introduce students to the latest issues of control and regulation of electric drives, taking into account the focus of their docto		
	gy conversion parameters in electric drive systems and relevant power electronics, in particular by using modern control and ectric AC drives, especially drives with asynchronous and synchronous motors.	regulation algoriti	iiis. The course
is mainly locused on ele	iodio no diffeo, especially diffeo mui asynonionous and synonionous motors.		

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	Z,ZK	idespread use
· ·	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 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 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 be presented in the course will be course will be presented in the course will be course will be course will be course will be course with the		-
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	scussed. 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
XP13NM	New Matherials and their Application	Z,ZK	4
	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, t	ZK	t the scope of
=	nt of the 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
XP14MTD	New Trends in Converter Technology	ZK	4
	conductor devices. Pulse Width Modulation methods for current and voltage control. Single-phase PWM converter. Converters wi		• .
converter with active cur Resonant converters.	rrent 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
<del>-</del>	dels and theory. Switching arc physics. Interaction between switching breaker and electric circuit. New knowledge in electric a	-	
extinguishing medium o limitation. Electric conta	in physical process in arcing chamber. Switcher braking capacity and possibility of their inducement. Fuses theory. Electric cir ct theory	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		and (ordinary
• •	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	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	ration of their prop	perties using
Maple and computer gra		71/	4
XP01NLA  Background matrix alge	Numerical Linear Algebra   bra. Norms of vectors and matrices. Numerical linear algebra. Special systems. Eigenvalues and eigenvectors. Iterative meth	ZK dods. Matrix invers	4 sion, Singular
-	eneralized solutions of linear systems.		
XP32NMR	Numerical Methodes of Electromagnetic Tasks Solution	ZK	4
•	ınalysis 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 t		
	apparatus and understanding the physical principles of the solved tasks in symbiosis to particular used software.	Junuerstanding ti	ne mamematical
XP17NME	Numerical Methods in Electromagnetic Field	ZK	4
	z and wave equations. Analytical, semianalytical, seminumerical and numerical methods. Matrix equations and algorithms: Mo	_	· ·
•	od of Moments, Multiple MultiPoles, Boundary Element Method, Finite Difference Method, Finite Element Method, Finite Integr tions: direct methods, Gauss-JordanOs elimination, pivotation, LU-decomposition, banded and sparse matrix, conjugate-grad		ibility of solution.
XP34EHA	Renewable Energy Microsources for Electronics - Energy Harvesting	ZK	4
	system integration applied in the design of digital and analog systems with application of system engineering, in i tis solved in	1	
	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.			
XP37IPP	Image Processing and Photonics	ZK	4
	cipline used in space technology. Students will become acquainted with advanced imaging photonics used in space sciences, ir 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		
· · · · · · · · · · · · · · · · · · ·	ne reconstruction of the acquired image, and discusses its use in space applications. In addition, there are parts including Earth	-	- 1
and the use of modern i area, including image d	nstruments in this area, including optical Fourier transform, electromagnetic wave polarization research, and hyperspectral in ata telemetry	aging and data p	rocessing in this
aroa, molaumy image u	aa aanaa j.		

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		
•	ow to obtain a trademark and also how to succeed with IP protection at the international level. The course also deals with lic		
	rhods as part of a standard way of commercializing original IP. Emphasis is put on quality methodology for database searching the projects. Motto: Those who do not protect the results of their research work can never dream of being on par with the bes	-	Successiui
XP35OFD	Estimation and Filtering	ZK	4
	t design, structure selection and parameter estimation. Bayesian approach to uncertainty description. Posterior probability de		
·	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.	0 , 11	·
XP35ESF1	Estimation and filtering	ZK	4
Methodology: experimen	nt design, structure selection and parameter estimation. Bayesian approach to uncertainty description. Posterior probability de	nsity function and	point estimates:
MS, LMS, ML and MAP.	Robust numerical implementation of least squares estimation for Gaussian distribution. Parameter estimation and state filter	ring - Bayesian ap <sub>l</sub>	proach. Kalman
filter for white noise. Pro	perties of Kalman filter. Kalman filter for colored/correlated noise.		
XP33OSD	Real Time Operating Systems	ZK	4
	erating systems, system and user modes, memory protection, operating systems (OS) classification and types, special requ		
	cesses and application programs, kernel and its services, system calls. Concurrent processes and threads, inter-process community		
	es. Process scheduling, scheduling in single- and multiprocessor systems. Processor management, process creation and termina	-	-
<del>-</del>	rstem functions, disk allocation strategies, device drivers. Inter-process communication (IPC), IPC based on shared memory		
TCP/IP.	ion, critical section, deadlocks. Synchronization tools: semaphores, monitors, looks, deadlock detection and prevention. OS kern	ei components ior	internetworking,
XP37ODS	Optical Design and Simulation	ZK	4
XP17OV		ZK	4
-	Optical Fibers		· .
	bers, attenuation and dispersion, step-index fibers, gradient fibers, single and f1ibers, optical cables, splices and connectors enomena in optical, fibers, fibers for sensors.	s, optical libers me	asurements,
XP32OSY	· · · · · · · · · · · · · · · · · · ·	ZK	4
	Optical Systems tems are being more extensively used in a practice, particularly in a telecommunication networks. Tremendous transmission		
•	y factors making it attractive. The objective of this subject is to provide students with a more rigorous theoretical background		
function.	y taoloto making it attractive. The objective of this subject is to provide statems with a more rigorous theoretical background	or fiber and transi	mosion systems
XP35ORC1	Optimal and robust control	ZK	4
	rse about modern control design methods that formulate the design as a mathematical optimization. Besides teaching pract		-
	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		
	numerous topics are new and those few topics that already appeared in the master version will be discussed at a significan		
motivation is not just to g	ive practical tool but also to go through the proofs, discuss various interpretations, and survey the results from the latest literat	ure. From the stud	lent 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
· · · · · · · · · · · · · · · · · · ·	sume availability of a mathematical model of the system to be controlled (hence model-based control design). We will consider	r dynamical systen	ns in continuous
as well as discrete time,	P		
	linear and nonlinear, single and multiple inputs and outputs. Since all the design methods introduced in this course formulate t	-	an optimization,
	will come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming)	-	an optimization,
of variations, operator th	will come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) eory, differential games).	and infinite-dimer	an optimization, nsional (calculus
of variations, operator the XP36PSV	will come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) eory, differential games).  Parallel Systems and Algorithms	and infinite-dimen	an optimization, nsional (calculus
of variations, operator the XP36PSV Complexity measures a	will come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) eory, differential games).  Parallel Systems and Algorithms and scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnections.	and infinite-dimen	an optimization, nsional (calculus  4 beddings,
of variations, operator the XP36PSV Complexity measures a simulations. Communications	will come from the areas of optimization, both finite-dimensional (linear, quadratic, nonlinear and semidefinite programming) eory, differential games).  Parallel Systems and Algorithms and scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnection algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations	and infinite-dimen  ZK  tion networks, em . Fundamental par	an optimization, nsional (calculus  4 beddings, rallel algorithms
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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
- · · · · ·	ctical 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 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		_
-	I, biochemical sensors. Haematology analysers. Interference, corrections of measured values, standardisation in medicine. Ele		-
and skeletal muscles. E	lectrodes and circuits for biopotential measurement and electrical stimulation. Indirect measuring methods of biological and p	ohysical values.	
XP36PAS	Algebraic Specifications Prototyping	ZK	4
	syntax and semantics of a specification language (OBJ3), structured specifications, generic specifications, implementation of		
(C++).	log, translation into Lisp, term rewriting systems, abstract rewriting machine, prototyping of a specification, prototyping in OBJ3,	conversion to proc	edurai ianguage
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		
FMS. Transport and its	control. CNC for the control of FMS. Flexible assembling systems. Automated plants of future, conception and tasks. Efficience	y of FMS. Person	al problems.
XP15PEE	Transmission of Electricity	Z,ZK	4
* *	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 networks, prediction and limitation of disturbances due to non-linear loads. Static 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		of the power
XP38PSL	Aircraft Instrumentation	ZK	4
	students with the current technology used in aircraft with respect to instruments, systems and sensors working in the low-free	1 1	ith methods for
basic processing of sys	tem data. The course includes a detailed description of aircraft instrumentation and its resistance to external influences, a de	scription of aircraf	t power sources
	gineering, analysis of instruments and systems for measurement of engine and aerometric quantities, and a description of emer		-
•	expround related to nowadays technology and methodology utilized on aircraft. The course provides a detailed overview of question into a signal/data processing and discrept system design principles. The local part of the garren discrept system design principles.		
the field of aircraft instru	and their integration into signal/data processing and aircraft system design principles. The last part of the course discusses to the course discusses	ne current publish	ing activities in
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	1 1	
-	software support. Design and verification of reconfigurable systems, algorithms, EDA tools. Reconfiguration in System on Ch	_	
Seminars, experiments	with reconfigurable devices, case study, literature research.		
XP35RRD	Robust Control	ZK	4
	elected 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 deviations from an underlying the respect to the property of the statistical methods are replied to the property of the statistical methods are replied to the property of the statistical methods are replied to the statistical methods.		
•	nich are robust have been developed. It means that these methods are not so sensitive to small deviations from an underlying estimation and then we introduce the robust approach, some basic robust estimators of location (e.g. trimmed mean, Hampel	•	
	unction, breakdown point).	oominator, and me	,404.00 0.
XP33ROD	Pattern Recognition	ZK	4
	rz/wiki/courses/xp33rod/start	<u> </u>	
XP04R1	Russian language 1	NIC	
	or intermediate students who have an equivalent command of the language as someone who has completed book Raduga.	Course objective: A	Acquiring the
	I to get by in everyday situations and a basic understanding of straightforward technical texts.	714	
XP04R1ZK	Russian language 1	ZK	0
XP04R2ZK	Russian language 2	ZK	0
XP04R2	Russian Language 2	NIC	al propontations:
<del>-</del>	cluding messages, summaries, business correspondence and dissertation theses; understanding lectures and other listening sk iation. Russian realia and the way of Russian life.Besides the course books, the supplementary texts and AV aids are used.	ills, note-taking, or	ai presentations,
XP35FSC1	Flexible structures 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			
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	d actuators. The re	obust control
design of space modes			
XP16JAK	Quality Management	ZK	4
•	e organization. Statistical methods in quality management. Models of quality systems. Economic issues in quality assurance.	Implementation of	requirements
	Central of Mobile Robots	71/	
XP33RMD  Design of Intelligent Mol	Control of Mobile Robots bile Robots. Known Control Architectures. Top-Down and Bottom-Up Approaches. Overview and Comparison. Distributed Autor	ZK   nomous Motion Co	4 ontrol Modelling
	nood Mapping. Needed Sensors. Ground of Ethology. Imprinting. Taxe. Stimuli, Receptors. Multiple Motivated Behaviour. Rea		_
-	Robots Structure. Task- or Behaviour-Oriented Robots. Ways and Realisation of Robots Co-operation, Motivation, Observation	_	
and Imitation. Multi-Age	ent reinforcement Learning. Q-Learning. Action Selection Mechanism, Learning Method, Exploration Strategy. Emotional Learning.	ning. Evolutionary	Approach to
Synthetic Biology. Artific	cial Life. Virtual World Different Approaches. Robots Competition, RoboCup, Strategy Selection, Implementation. Open Problem.	∍ms.	

XP35CCM			
	Cooperative Control of Multi-agent systems	ZK	4
Cooperative distribute	d control is a relatively novel and rapidly developing area of control theory and engineering. Instead of centralized, large system	ms are considered	I composed of
,	ms, with local computation and communication capabilities. The broad aim is solving classical problems e.g. stabilization, track	0,	
	n and team cooperation robust to changes in communication topology and disturbance. Relevant topics of classical control thec	=	
-	natics needed for the course is also provided. The potential use of multi-agent cooperation in challenging applications involving		
	. Theory: Review of qualitative properties of dynamical systems, Motivation for distributed multi-agent systems, Elements of alg		-
	, Consensus and synchronization of linear/nonlinear, continuous/discrete-time systems, Cooperative stability, optimality and rob	oustness, Distribut	ed optimization
	ory, Interactions with environment.	71/	
XP33RSP	Management of Software Projects	ZK	4
XP32RTS	Telecommunications Systems Management	ZK	4
	systems Management is a discipline which deals problems of interactions of technical and business aspects of management of	telecommunication	on networks an
services provided.			
XP15RE	Control of Power Systems	Z,ZK	4
= -	power system control, feasibility and algorithms of optimization methods, handling of constrain conditions. Hierarchy and decor	-	_
=	timation. Load forecasting and load curve civering. Unit commitment. Optimization of operation with respect to net topology co		_
Dispatch, system and	ce. Control of frequency and active powers balance. Optimal power flow. Dynamical models of power stations and systems. Sol	ution of extraordin	iary states
XEP17SWR	Scientific Writing	ZK	4
	Scientific virturity d to help researchers organize and effectively communicate, in English, their scientific results. While the instructor is an Electri		•
applicable to all techni		cai Engineer, the	approacries ar
		7	4
XPE04SCWR	Scientific Writing	Z	4
	y-Hee Won]: With the assistance of a Fulbright Distinguished Chair at CTU and a Professor in Electrical Engineering for Temple Pennsyvania, USA), researchers will be instructed on how to organize and effectively communicate their scientific results. Whi		
	hes will be applicable to all technical disciplines. 2) SEMINARS [Michael Ynsua]: Under the guidance of a native-speaking Eng		
	of academic writing with the goal of sharpening critical writing skills (reasoning, formulating, and developing arguments and exp	· ·	-
	nics, usage, and style (grammar, etc).	oranamono). Opoola	a. a.t.o
XP15SPS	Coupled Problems in Heavy Current and Power Engineering	Z,ZK	4
	problem, classification of the coupled problems typical for heavy cur-rent and power applications. Mathematical description of t		-
	partial differential equations. Characteristics of electromagnetic-thermal problems (with respecting eventual thermoelasticity), elect		
	nechanical problems and also problems based on a com-bination of the electromagnetic field and electric circuits. Formulation of	•	
<del>-</del>	s of their solution. Information about available SW, its existing capabilities and perspectives.		•
XEP33VKR	Selected Topics in Pattern Recognition and Computer Vision	ZK	4
	fundamental results from computer vision and pattern recognition. The course treats selected key results, as well as latest are	·	•
	luence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeti		
=	ents with strong interest, possibly experience too, on a research topic that is relevant to the course.	Ü	
XP01SPJ	Syntax and semantics of a formal language	ZK	4
	of a formal language. A simple imperative language, assignment command. Denotational and operational semantics, coherence		
			ematical domai
•	functionals, recursive definitions. Lambda - notation. A simple functionI language, denotational semantics. New functions defin		
theory. Fixed points of	functionals, recursive definitions. Lambda - notation. A simple functionl language, denotational semantics. New functions defin s. Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming	itions, recursive c	
theory. Fixed points of Operational semantics	6. Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming	itions, recursive of language.	
theory. Fixed points of Operational semantics XP39SCG		itions, recursive of language.	onstructions.
theory. Fixed points of Operational semantics XP39SCG The Seminar in Comp	s. Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming Seminar in Comnuter Graohics	itions, recursive of anguage.  ZK  ethndc mnrlelino n	onstructions.  4 f srrrfacec qnd
theory. Fixed points of Operational semantics XP39SCG The Seminar in Comp fheir nntical nronerties	s. Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming  Seminar in Comnuter Graohics  uter Graphics will make students familiar with selected research topics from computer graphics srrch aq efficienf renderino me	itions, recursive of language.  ZK  ethndc mnrlelino noted in related hisci	onstructions.  4 f srrrfacec qnd piines such as
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theory. Fixed points of Operational semantics XP39SCG The Seminar in Compfheir nntical nronerties image processing, corskills by analyzing exist	s. Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming Seminar in Comnuter Graohics  uter Graphics will make students familiar with selected research topics from computer graphics srrch aq efficienf renderino me a qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics methods us inputer vision, and human computer interaction. The goal ofthe course is to expound the selected topics to students and in the same	altions, recursive of language.  ZK  athndc mnrlelino noted in related hisciane time to improve	onstructions.  4 f srrrfacec qnd piines such as /e their scientifi
theory. Fixed points of Operational semantics XP39SCG The Seminar in Comp fheir nntical nronerties image processing, cor skills by analyzing exisgathered knowledge to	So Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming Seminar in Comnuter Graohics  uter Graphics will make students familiar with selected research topics from computer graphics srrch aq efficienf renderino me a qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics methods us inputer vision, and human computer interaction. The goal ofthe course is to expound the selected topics to students and in the sating high quality research rvork. A significant added value is the acquaintance of students with methods of scientific work in co	altions, recursive of language.  ZK  athndc mnrlelino noted in related hisciane time to improve	onstructions.  4 f srrrfacec qnd piines such as /e their scientifi
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theory. Fixed points of Operational semantics XP39SCG The Seminar in Comp fheir nntical nronerties image processing, cor skills by analyzing exisgathered knowledge to XP39SPG The computer graphics simulation of natural p	Sominar in Comnuter Graohics  User Graphics will make students familiar with selected research topics from computer graphics srrch aq efficienf renderino me a qimrrlafinn of inhyqical inhenimena or geometrical modeling and animation. The course rvill also include graphics methods us inputer vision, and human computer interaction. The goal ofthe course is to expound the selected topics to students and in the satisfied quality research rvork. A significant added value is the acquaintance of students with methods of scientific work in consolve specific problems of their PhD theses.  Computer Graphics Seminar  Is seminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface mathenomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used in rel	attions, recursive or planguage.  ZK  atthndc mnrlelino no ed in related hisci arme time to improvennection with the education of the content	onstructions.  4 f srrrfacec qnd piines such as ve their scientifi aim of using th  4 otical properties ciplines such a
theory. Fixed points of Operational semantics XP39SCG The Seminar in Comp fheir nntical nronerties image processing, cor skills by analyzing exisgathered knowledge to XP39SPG The computer graphics simulation of natural pimage processing, cor	Seminar in Comnuter Graohics uter Graphics will make students familiar with selected research topics from computer graphics srrch aq efficienf renderino me a qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics methods us inputer vision, and human computer interaction. The goal ofthe course is to expound the selected topics to students and in the satisfing high quality research rvork. A significant added value is the acquaintance of students with methods of scientific work in consolve specific problems of their PhD theses.  Computer Graphics Seminar seminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface mathenomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used in religious problems. The graphics is the participating students. The graphics is consolidated and interaction based on the particular topics of PhD theses of the participating students. The graphics is consolidated and interaction based on the particular topics of PhD theses of the participating students. The graphics is consolidated and interaction interaction based on the particular topics of PhD theses of the participating students.	atterials and their oplated research disgoal of the course	onstructions.  4 f srrrfacec qnd piines such as ve their scientif aim of using th  4 otical properties ciplines such a
theory. Fixed points of Operational semantics XP39SCG The Seminar in Comp fheir nntical nronerties image processing, corskills by analyzing exisgathered knowledge to XP39SPG The computer graphics simulation of natural primage processing, corthe selected topics to	Seminar in Comnuter Graohics  User Graphics will make students familiar with selected research topics from computer graphics srrch aq efficient renderino me a qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics methods us reputer vision, and human computer interaction. The goal ofthe course is to expound the selected topics to students and in the satisfing high quality research rvork. A significant added value is the acquaintance of students with methods of scientific work in consolve specific problems of their PhD theses.  Computer Graphics Seminar  Seminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface mathenomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used in relimputer vision and human computer interaction based on the particular topics of PhD theses of the participating students. The gather students and by analyzing selected highly influential research publications to further develop the research capabilities of the	attions, recursive or planguage.  ZK  Athndc mnrlelino not be din related hisci ame time to improve the connection with the control of the course the students.	onstructions.  4 f srrrfacec qnd piines such as ve their scientif aim of using th  4 otical propertie ciplines such a is to introduce
theory. Fixed points of Operational semantics XP39SCG The Seminar in Comp fheir nntical nronerties image processing, cor skills by analyzing exisgathered knowledge to XP39SPG The computer graphics simulation of natural primage processing, cor the selected topics to XP36SEP	Seminar in Comnuter Graohics uter Graphics will make students familiar with selected research topics from computer graphics srrch aq efficienf renderino me a qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics methods us inputer vision, and human computer interaction. The goal ofthe course is to expound the selected topics to students and in the set is solve specific problems of their PhD theses.    Computer Graphics Seminar   Computer Graphics Seminar	attions, recursive or planguage.  ZK  Athndc mnrlelino not be din related hisci ame time to improve annection with the statement of the course are students.  ZK	onstructions.  4 f srrrfacec qnd piines such as ve their scientif aim of using th  4 ptical propertie ciplines such a is to introduce
theory. Fixed points of Operational semantics XP39SCG The Seminar in Comp their nntical nronerties mage processing, coreskills by analyzing exist gathered knowledge to XP39SPG The computer graphics simulation of natural primage processing, core the selected topics to XP36SEP Overview of architecture.	Seminar in Comnuter Graohics uter Graphics will make students familiar with selected research topics from computer graphics srrch aq efficient renderino me a qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics methods us inputer vision, and human computer interaction. The goal ofthe course is to expound the selected topics to students and in the set sting high quality research rvork. A significant added value is the acquaintance of students with methods of scientific work in consistency specific problems of their PhD theses.  Computer Graphics Seminar seminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface mathenomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used in religious and human computer interaction based on the particular topics of PhD theses of the participating students. The graphics on Architectures of Parallel Computers  Tese of high-performance computers and trends in technologies. Memory coherence and sequential consistency models. Share	attions, recursive or planguage.  ZK  Athndc mnrlelino not be din related hisci ame time to improve annection with the statement of the course and their oplated research disposal of the course are students.  ZK  ed-memory archite	onstructions.  4 f srrrfacec qnd piines such as ve their scientif aim of using th  4 otical propertie ciplines such a is to introduce  4 ectures: buses
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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.	7 71/	4
XP37SZS	Statistical Signal Processing and detection theory. General properties and fundamental limits. ML, LS, Bayes (MAP,MSE), NP, MM estimators and detecto	Z,ZK	4 eory (Kalman
	on and parameter estimation.	13. Adaptive liiter tii	eory (Raiman,
XP16SDE	Building heritage of the industrial era	NIC	2
XP16STV	Product Strategy	ZK	4
	olicy, pricing and contractation policy, communication, distribution. Marketing mix. Inovations. Concepts of marketing strategy.		
	ategic marketing simulation Markstrat.	•	•
XP36STR	Stringology	ZK	4
Processing of strings	and sequences. General, ordered alphabet. Generalized and weighted strings. Finite and infinite alphabet. Searching in text,	dictionaries and lan	guages. Exact
	hing. Forward and backward matching. Searching in compressed text. Searching in more-dimensional text. Searching for longest	common factors and	d subsequences.
	ties in text. Construction of covering of text. Representation of text, prefix, suffix and factor automata, suffix trees and arrays.		
XEP33SML	Structured Model Learning	ZK	4
Networks.	ne learning course covers learning and parameter estimation for structured models like Markov Random Fields, Belief Networ	rks and (stochastic,	Deep Neurai
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		
	semiconductor technology. IC design, design of technology. Design rules. Reliability, yield. Outlooks and limitations of IC deve		
XP15ZSS	Light sources and Equipment	Z,ZK	4
XP33SCD	Man-Machine Systems	ZK	4
	ne systems development. Human operator tasks. Manual control, supervisory control cognitive control. Typical structure of a cor		ution of priorities
	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. Human-machine interaction.	uman error detectio	n. Man-machine
	-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 ove	•	
in CIM systems.	ns. Reduction methods, formal languages and algebraic description of PNs. Timed PNs and modeling in P- and T-timed PNs. F	Practical examples	and applications
XP38SYS	Measurement and Data Acquisition Systems	ZK	4
	s the principles and technical means of data acquisition in the laboratory and industrial environment. Attention is paid to both		•
-	ems for data acquisition and process control. Laboratory exercises are designed in part in the form of classical tasks, partly in		-
	ming of automated measurement systems and control of measurement processes.		
XP13SRD	Real Time Systems for Process Control	7 71/	4
M IOOND		Z,ZK	4
	f real time control paradigm. Architecture of real time systems. State transition diagram of real time systems. Semaphore and d	1 ' 1	•
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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	guide structures. I	Design and
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 distributair-gaps. Coupled systems.	ed elements. Acous	siic waveguides,
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		
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	1	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 considered in the course gives to doctoral studies and numerical simulations of interactions.	ctions of electroma	gnetic waves in
the visible part of the spectrum (and adjacent UV and IR bands) with biological tissues. And to learn about modern optoelectronic sensor concepts a	and their application	ns in the field of
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 / Sim		
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 image		
Diaphanoscopy, IR thermography, Laser Doppler perfusion imaging (LDPI), Photoplethysmo-graphy imaging (PPGI), optical coherence tomography		,
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	1	ation algorithms
(least-squares methods) and with their accuracy. The student will study error magnitude derivation and will get information concerning the choice of co	ompromises betwe	en convergence
rates and precision. It will be revealed that massively used satellite navigation methods suffer from many deficiencies under real environment conditio	ns. 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 process of the sensors based on radio as well as non-radio principles.	•	
based on Signals of opportunity processing; they are included in the course, too. The student will verify the achieved results by individual laboratory		
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.	7.71/	4
XP37TAS Acoustic signal processing and theory  Acoustic signal classification, sources, description of properties. Statistical analysis of acoustic signals. Spectral analysis of signals, Fourier transform	Z,ZK	•
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	ZK	4
Finite automata. Nerod theorem and its applications. Nondeterministic automata. Regular expressions nad Kleene theorem. Grammars and their class	sification. Cotnext	-free grammars.
Chomsky hierarchy. CYK algorithm for context-free grammars. Turing machines, decision problem. Algorithmically nonsolvable problems.	7.71	4
XP15TOS Theory of Light field  Theory of light field Methomolical description of emission of unsummetrical luminaires. Bhotomatry of distants and close point. New phare statistics.	Z,ZK	4
Theory of light field. Mathematical description of emission of unsymmetrical luminaires. Photometry of distante and close point. New characteristics of Flux method calculation of integral characteristics. Light field of surface type and cube type luminaire. Light flux distribution from point source. Distrib		
Distribution of light flux of surface source. Interreflection theory. Design of indoor illumination using PC.	dion of light hax c	n intear source.
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). It	1 1	
and modeling 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		
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.		
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	nodels, LPC cepst	rum. Signal
classification - spectral distances, Markov models, neural nets, signal prediction.		
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		
from the prime laws of fluid dynamics. These equations are utilized for derivation of a linear wave equation under the acoustical approximation; its specific polytical set the wave equation and Helmholtz acquaites are formulated using the integrals of Kirchhoff Helmholtz and Boyleigh Heimholtz and		
General solutions of the wave equation and Helmholtz equation are formulated using the integrals of Kirchhoff-Helmholtz and Rayleigh. Using these intradiation and diffraction are studied. Problem of the acoustic field description is further developed using the methods of Fourier acoustics.	.egrais, some prob	lerns of acoustic
	71/	4
XP17TAM Evaluation of Applicators for Microwave Thermotherapy  Lectures are focussed on methodology of evaluation of microwave applicators, which means measurements of SAR distribution in water phantom as	ZK	•
distribution in various types of agar phantoms. Further design and optimisation of measuring probes is discussed, methodology of probes calibration		
are described. Numerical modelling of microwave applicators by aid of software product FEMLAB, comparison of mathematical and experimental model.		3.41441011
XP33TTM Text mining	ZK	4
- · · <b>V</b>		-

	Ultrasound and Quantum Acoustics	ZK	4
The purpose of these le	ctures is to familiarize doctoral students with the issues of ultrasonic waves needed for the design of a wide range of ultrason	nic devices and to	discuss in detail
	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
_	ues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving	•	-
	search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of pattern reco	•	ases. Knowledge
XP01UAG			4
	Introduction to Algebraic Geometry plantion sets of solution sets of systems of polynomial equations in more than one variable and their relationship with the ideals in polynomial	rings Dickson's I	4 emma Hilhert's
	er's bases and their properties, Buchberger's algorithm for searching a Groebner's basis, elimination theory, Hilbert's Nullste	_	
varieties and radicals.	,	, , , , , , , , , , , , , , , , , , , ,	
XP02UEF	Introduction to Electrophysiology	Z,ZK	4
Course is oriented on a	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	types of lasers, in	ncluding their
	zes the main properties of laser radiation and briefly indicates the possibilities of creating short pulses of radiation. The next	-	
	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		71/	4
XP37ISS	Introduction to space science and technology ieroces and technology on PhD level. Methods and resources of space research and their applications. Satellites, space prot	ZK	4
· ·	their development, proposals and design. Optoelectronic systems for space, onboard systems and payload, space commun		
'	their development, proposals and design. Spacelestionic systems for space, on board systems and payroad, space community. Remote sensing and multispectral images, applications. Space physics, cosmic environment, cosmic radiation and particle	-	-
_	e software, archiving and data reduction, organization international co-operation.	00. 0.000 20000	oogoru, tooto
XP01UKS	Introduction to Quantum Structures	ZK	4
Basic course of quantur	n structures. The notions of an orthomodular lattice, orthomodular poset, orthoalgebra, effect algebra, state, center are introd	uced. Basic prope	rties of quantum
	ncluded representations of quantum structures.		
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		-
	ention 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 gebras. We pay a big attention on the variety of alternative and Jordan superalgebras.	onsider varieties (	or superaigebras
XP15UEE		Z,ZK	4
	Electric Energy Use and Conservation	Z,ZK	4
XP13VTK	Vacuum technology and cryogenics		•
l -	ous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Princ chievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating sy		
	chievernent of low temperatures. Properties and behavior of matters at low temperatures, mansport of heat and insulating sy		
	ry.Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuur	•	•
temperature thermomet	ry.Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuur	n technology and	cryogenics.
temperature thermomet	Science, Technics and Technology in the Historic Landscape of the Czech Lands	n technology and	cryogenics.
temperature thermomet XP16HKC XP16VTK	Science, Technics and Technology in the Historic Landscape of the Czech Lands Everyday Science and Technology	n technology and ZK	cryogenics.  4  4
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XP38VDI	Selected Chapters of Diagnostics	ZK	4
	advanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, a		
	ng, the corresponding advanced signal processing, and self-acting evaluation in order to improve reliability, availability, mainted		
XP36VPD	Selected Parts of Data Mining     Selected Parts of Data Mining	ZK	4
-	e data, it is important to resolve both the technical issues such as distributed computing or hashing and general algorithmic c		
	by case studies on web and social network mining. The second part will discuss approaches that merge heterogeneous price		
	e the main application field here. It is assumed that students have completed the master course on Machine Learning and Da	_	
XP01VPS	Selected topics in probability and mathematical statistics	ZK	4
Students will learn the t	erms of probability and procedures of mathematical statistics that go beyond commonly taught methods.		
XP33PUD	Artificial Intelligence	ZK	4
	nunication with a computer, phases of processing, syntactic analysis, grammars including DCG. Understanding a sentence, s		-
	zation. Knowledge engineering and knowledge elicitation. Machine learning -review of methods and tools. PAC learning. Learn	ing in 1st order lo	gic, ILP. Planning
and scheduling. XP17ANS	Coloated Chanters from Antannas and Branagation	ZK	4
_	Selected Chapters from Antennas and Propagation  and modern antenna technology. Selected problems of antennas and propagation for fixed and mobile communication, earth		-
· · · · · · · · · · · · · · · · · · ·	nt services and communication. Topics of near a far field antenna measurement, compact antenna measurement. Measurem		
services. Antenna anec		· ·	·
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, intel		interferometers,
diffraction, optical gratin	ng, holography, methods of visualization, normal and anomalous dispersion, optical image formation, optical devices, photom	etry, colorimetry, a	atoms radiation,
stimulated emission, las			
XP33ROZ	Selected Topics in Pattern Recognition	ZK	4
•	urse in pattern recognition (e.g. P33ROD, 33RPZ). Selected topics: Anderson's problem, Kozince algorithm, kernel perceptron		
· ·	z. Deterministic learning. Unsupervised learning: Robbins algorithm and emprirical Bayesian approach. Expectation-minimiza	ition algorithm. Re	cognition of
XP16MVE	d acyclic graphs. Markov models. Combination of weak classifiers: boosting and bagging. AdaBoost.	ZK	4
-	Selected Problems of Economy and Management of Energy process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning w	1	-
	production management, standardization. Controlling, production management methods.	iiii iespeet to prod	delion typology.
XP37SFA	Fundamentals of Physical Acoustics	ZK	4
	ticity, Carthesian tensors. Theory of small deformations, dynamic equations of isotropic elastic medium. Microscopic model o	1	
Dynamics of vascous flu	uids. Stationary flow of vascous fluid.		
XP16STM	Selected Statistical Methods	ZK	4
Descriptive statistics.Tra	ansformation of random variables. Aproximation of theoretical distributions. Interval estimates. Hypothesis testing. Simple and m	ultiple regression.	Analysis of time
series.Index number.			
XP36VAV		ZK	4
XP39VPG	Computational Geometry	ZK	4
	onal geometry (CG), data structures and paradigms, methods of geometric search, convex polygons and hulls, applications of		• •
•	gulation, efficient intersection algorithms, intersection of semispaces and polygonal regions, geometry of rectangles, dual ma of computer graphics and CG. Students who completed course 36VGE cannot enroll.	ippings and space	es, convex null in
XP36VAP	Advaced Computer Architecture	ZK	4
	ism (pipelined, superpipelined and superscalar systems). Basic limitations to parallelism (structural, data and control hazard:		
-	f order). Register data flow, software and hardware solutions, interlocking, scoreboard, control stack. Memory reuse, register re	•	
Parallel systems, perfor	mace evaluation, HPCC, supercomputers. Shared memory multiprocessors (bus, switch, switched memory). Interconnection	structures. Cache	coherence
•	ocessor systems. MIMD systems UMA, NUMA, COMA. Distributed memory multiprocessors (crossbar switch). Data flow syst	ems, multithreadir	ng. Accelerators,
special architectures.			
XP12VVM	Development and Research of Materials	Z,ZK	5
· · · · · · · · · · · · · · · · · · ·	materials wth specific electrical properties. Diagnostics of materials in electrotechnology. Polymers. Phase transitions. Thin a cells. Models of function of biomaterials.	ina tnick conductiv	e layers on
XP13VVM	Development and Research of Materials	Z,ZK	4
	materials with specific electrical properties. Diagnostics of materials in electrotechnology. Polymers. Phase transitions. Thin a		
· · · · · · · · · · · · · · · · · · ·	r cells. Models of function of biomaterials.		
XP16VTS	Development of Technical Universities	ZK	4
XP13VNM	Research of new materials	Z,ZK	4
	e topics of materials such as Piezoelectrics, pyroelectrics and ferroelectrics without lead, Multiferroics, Special magnetic elements		rials and carbon
nanomaterials, Bio-insp	ired materials and hybrid organic inorganic materials, Polymers and composites containing polymer for electrical engineering	g, Nanofibers, Met	tals ( ODS, HEA
- ·	ontent of amorphous / crystalline / nanocrystalline mass, Metals with extreme dependence of electrical resistance on temper		
	Phavior, Carbides and nitrides (MAX phase). Critical methods for study of these materials will be discussed - Characterization		
simulation of temperatu	es, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by imper re and el fields	uance analyzers, l	vioueling and
XP15VME	Research Methods in th Use of Electrical Energy	Z,ZK	4
	thematics of continuum physics. Physical conservation laws. The laws of electromagnetic field. Similarity theory in thermo-ac		
	athematical modeling. Analytical solutions of electromagnetic field. Discrete parameters and their relation with field parameters.	· =	
<del>-</del>	of fields. Non-deterministic modeling. Experiment and data processing, practical examples.		
XP02ZFP	Fundamentals of the Plasma Physics	ZK	4
•	you with a basic knowledge of plasma physics and of its applications. Plasma definition. Main plasma characteristics. Collision	ons of charged pa	rticles. Fluid
model Magneto-hydrod	dynamics. Aplications.		

KP33KHD	Introduction to Game Theory	ZK	4
	prief survey on classical and contemporary theory of games. It includes the elements of the utility theory, decision-making theory,	1	•
	d minimax) and the basic concepts of coalition games, especially its solutions (core and value) and relation to the market moc	-	non cooperativ
P33ZPM		ZK	4
	Interest action to Commutat Vision		4
(P33ZVD	Introduction to Computer Vision of exist anymore. Its last lecture run in the academic year 2021/2022.	ZK	4
		71/	
P33POS	Fundamentals of Possibilistic Measures	ZK	4
	es present a mathematical tool for uncertainty (randomness) quantification and processing applying the notions and apparatus		
•	oilistic measures in the sense that they are based on the maxitivity priciple in spite to the additivity principle applied in the stan	•	•
	that the operation of maximum (supremum) can be defined also in certain non-numerical structures, possibilistic measures ta	-	-
easure and proba	ar, in complete lattices, are worth being investigated. The lecture will not suppose any preliminary knowledge in fuzzy set thec	ory, lattice theory or the	ie stariuaru
<u> </u>	• •	71/	
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 intens		-
	axitivity principle replacing the additivity principle applied in the classical measure theory. Besides the real-valued possibilistic es taking their values in complete lattices will be introduced and analyzed.	measures also non-r	iumencai
		714	
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 repre-		-
	presentations are studied. Comparison theory of projections, states and representations is explained. Von Neumann algebras a	are classified as finite	and infinite 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. Multiresoluti	on analysis. Applicati	ons to signal
rocessing.			
P37ZI	Information recording	Z,ZK	4
-	theory. FM signal recording. Video information recording systems. High density recording, tape recorder thin heads. Impulse r		_
-	dio, DAT. Digital recording on CD-ROM, CD-video. WORM, CD-R recording. Erasable magneto-optical recording on MD. Digital	al video recording. Co	oding, data
ompression.	T		
P34RSD	Radiation Saurces and Photodetectors for Integration	ZK	4
	quainted stimulated emission in semiconductors. Homogeneous and heterogeneous junction, double heterostructure laser. Wa		
	antum wells. Electromagnetic fields in semiconductor lasers. Types of lasers and their properties. Tunable injection lasers. Spe		-
-	istic, coupling the laser to a waveguide. Bi-stable and voltage devices, switches. Non-coherent LED's, super-luminescence dio		
•	cations, injection and coherent external modulators. Injection laser amplifiers. Principles of nano-optoelectronic components. I		
	oduced to new principles of integrated optoelectronic components and subsystems for informatics and sensor technique, desi	· ,	mologies.
P33ZDD	Processing of Biological Data	Z,ZK	
P31ZBS	Biological Signal Processing	ZK	4
	th the processing of biosignals and advanced methods of processing resulting from current research in solving common project		h top institutio
	nstitutes of the ASCR, foreign universities). The subject concept allows us to respond flexibly to new directions and knowledge		
P37ZSN1	Signal processing in satellite navigation systems 1	Z,ZK	4
	ient with pseudorandom signals and with carrier. Position determination based on measured distances. Time delay discrimina	tor. Schema of range	navigation
ceiver. GDOP, PD	OP, HDOP, VDOP. GPS system, precision. Glonass and its precision. GALLILEO. Comparison of these systems.		
P37ZSN2	Signal processing in satellite navigation systems 2	Z,ZK	4
	rigation systems, structure of receiver and precision of position measurement. Shortcomings of satellite systems: limited acce	ess and integrity, RAIM	√ and GIC,
	rential systems DGPS and DGLONASS, RTCM-104 standard. Systems SKY-FIX, FUGRO, RACAL, WAAS, EGNOS. GALILEC	O and its prospective.	. GPS III.
oppler satellite nav	ornial dystomo Bot o and Boto wite, Krow to retain and byttem of the rive, to order, twice, to the control of the rive, to order, twice, to the control of the rive, to order, twice, to order or the control of the rive, to order, twice, to order or the control of the rive, to order or the rive, to order or the rive, to order or the rive		
oppler satellite nav ugmentation. Differ	3D Computer Vision	ZK	4
oppler satellite nav ugmentation. Differ P33VID			
oppler satellite nav ugmentation. Differ P33VID troduction to persp	3D Computer Vision	espondence problem,	structure from
oppler satellite nav ugmentation. Differ P33VID troduction to persp otion. The stereose	3D Computer Vision pective geometry, perspective camera. Fundamental and essential matrices, their robust estimation, camera calibration. Corre	espondence problem, f the dense correspon	structure from

## 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:	pecome familiar with the theory and applications of computational intelligence methods in the context of systems capable of learning froi	n data. Introduction	ı, motivation
for learning, comp	utational intelligence. Supervised, unsupervised and reinforcement learning paradigms. Fuzzy systems, neural networks, neuro-fuzz	y systems, and oth	ier general
function approxima	ators for supervised learning. Fuzzy clustering methods for unsupervised learning. Reinforcement learning for single-agent and multi	-agent systems. Ex	kamples of
	applications and case studies. The course will be connected with - a computer assignment with Matlab/Simulink and a literature assignme	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	rught in WS 2023/24 for the last time. It will not be opened anymore. Markov models on graphs represent a model class widely applie	d in many areas o	f computer
science, such as co	emputer 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 ex-	ZK xtension of finate	4 ly additive
Badio proportioo	measures (the Horn-Tarski technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theor		y additivo
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. Matchir //ertex cover and independent sets. Cliques. Colorings. Plannar graphs. Graphs and vector spaces. The content of the course is modified.	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 classifications. Chomsky hierarchy. CYK algorithm for context-free grammars. Turing machines, decision problem. Algorithmically nonsolvable pro	ation. Cotnext-free	1
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 ring bebner's bases and their properties, Buchberger's algorithm for searching a Groebner's basis, elimination theory, Hilbert's Nullstellens		
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.		1
	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 univer	_	
XP01USA	An introduction to superalgebras.  In the theory of superalgebras. We introduce notions of a graded algebra, superalgebra, Grassmann envelope of a superalgebra. Considerate 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 representations are studied. Comparison theory of projections, states and representations is explained. Von Neumann algebras are class	-	
VD047W/T	structural types I, II, III.	71/	1 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
	s, interference, Huygens principle, sound field in ducts, vawe-guides and enclosures. Active noise control in a duct. One or more secon istic coupling, modes, local control. Feedback and feedforward strategy, analog adn digital realisations, algorithms based on LMS, stabill algorithms. Practical realisations of active systems. Active control of vibrations, transducers for active 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 insufficiency. The students will learn how to measure blood pressure under various degrees of load and provided to provide a parameters. The students will be complemented by provided two provided to provide a parameters.	•	
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 d large. Arc. Corona. Spark discharge. Lightning. Ball lightning. Z-pinch and its properties. Electromagnetic collapse. X-ray sources, cont magnetic fields of Earth.	isplays. High-freq	uency and
XP02EVA	Physics for Electroenergetics	ZK	4
	elected 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 ir 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 violent particular violent processes, organ conservation methods and progressive surgery methods will be spoken a many practical knowledge via labs.		
	Noise Surveys	ZK	4
XP02HS			
XP02HS Sound field, noise	e and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise map sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise contro		
			4
XP02MHD  XP02MPF	sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise contro  Magnetohydrodynamics  Qualitative description of the behaviour of hot plasma in magnetic fields	ZK Z,ZK	
XP02MHD  XP02MPF  XP02PT	sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise contro  Magnetohydrodynamics  Qualitative description of the behaviour of hot plasma in magnetic fields  Plasma Technologies	ZK Z,ZK ZK	2 4
XP02MHD  XP02MPF  XP02PT  XP02SF	sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise contro  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.	ZK Z,ZK ZK Z,ZK Z,ZK	4 2 4 4 4
XP02MHD  XP02MPF  XP02PT  XP02SF  XP02TF1	sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise contro  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	ZK Z,ZK ZK Z,ZK Z,ZK Z,ZK	4 2 4 4 4
XP02MHD  XP02MPF  XP02PT  XP02SF  XP02TF1	sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise contro  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.	ZK Z,ZK ZK Z,ZK Z,ZK Z,ZK	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	if the wave equation and Helmholtz equation are formulated using the integrals of Kirchhoff-Helmholtz and Rayleigh. Using these integrals are radiation 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	Z,ZK	4
XP02UFL	Course is oriented on anatomical, physiological and physical aspects of selected electrophysiology problems.  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		
	acterizes the main properties of laser radiation and briefly indicates the possibilities of creating short pulses of radiation. The next par		
in various areas o	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)
	dealing with the given issue.		
XP02UZ	Ultrasound and Quantum Acoustics	ZK	4
	se lectures is to familiarize doctoral students with the issues of ultrasonic waves needed for the design of a wide range of ultrasonic c 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		cuss in detail
XP02VNP	Plasma Waves and Instabilities	Z,ZK	4
-	mena will be introduced in the first part of the lecture (dispersion relation, phase and group velocities, Fourier analysis). Fundamenta		1 -
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
-	wave 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		
dimaction, optical (	stimulated emission, lasers.	, colorimetry, atom	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	ns 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 ).  English language 1	ZK	0
	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,
XP04A2SZK	writing CV). Oral presentations.  English Language	ZK	0
XP04A2ZK	English language 2	ZK	0
	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	' '
XP04AZK	English Language	ZK	0
	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.		$\overline{}$
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	ehension of
	es). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by postg		
	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 during the debate . Account is also the linguistic correctness of written text.	quickly and corre	ectly respond
XP04N1	German language 1	NIC	T
-	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
conversation less	ons for advanced students based on 5 video tapes about these topics: postgraduate studies, professions, internships abroad, profess	sional and scientifi	ic work, the
VDC 41474	profession of an engineer. Revising and extending typical grammar for technical style, syntax of technical texts.	71/	
XP04N1ZK	German language 1	ZK	toxt Pooding
_	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.		
	<del>-</del>		

XP04N2	German language 2	NIC	
-	German language 2 	_	l ers, reviews
	presentations etc.)ations etc.)	,, ,	
XP04N2ZK	German language 2	ZK	0
XP04R1	Russian language 1	NIC	
The course is sui	itable for intermediate students who have an equivalent command of the language as someone who has completed book Raduga. Cotal language skills required to get by in everyday situations and a basic understanding of straightforward technical texts.	urse objective: Ac	quiring the
XP04R1ZK	Russian language 1	ZK	0
XP04R2	Russian Language 2	NIC	
•	xts including messages, summaries, business correspondence and dissertation theses; understanding lectures and other listening skills; retructures and pronunciation. Russian realia and the way of Russian life.Besides the course books, the supplementary texts and AV aid	•	esentation
XP04R2ZK	Russian language 2	ZK	0
XP04S1	Spanish language 1	NIC	0
ncreasing active k	nowledge 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.	c grammar and le	xis.Listenin
XP04S1ZK	Spanish language 1	ZK	0
XP04S2	Spanish language 2	NIC	0
	rills(listening,understanding a Spanish text of cca 120 pages, writing, speaking). The skills are practiced on writing letters, presentation		
etc. Indi	ividual home preparation is necessary. Materials are chosen with regards to the study field of a postgraduate. High-level and fluent specific	ech is demanded	d.
XP04S2ZK	Spanish language 2	ZK	0
XP04 1	Czech language 1	NIC	0
XP04 2	Czech language 2	NIC	0
XP12IMM Review methods so	Engineering Methods in Mechanics  olution of problems in rigid bodies mechanics, hydromechanical , thermodynamic and electromechanical systems. Dynamics of combine-	Z,ZK d systems with us	4 ing method
of vectorial and a	analytical mechanics, assembling of mathematical model and resources for simulation. Identification of system parameters with respec	t to passive resist	ances and
	energy losses. Physical similarity and analogy, dimensional analysis, dimensionless parameters, PI-terms, fundamentals of experiment		1
XP12VVM	Development and Research of Materials	Z,ZK	5
Research of con	nposite materials wth specific electrical properties. Diagnostics of materials in electrotechnology. Polymers. Phase transitions. Thin and polymers. Organic solar cells. Models of function of biomaterials.	thick conductive	layers on
XP13DEZ	Degradation processes of electridal equipment	Z,ZK	4
	rizes students with the basic processes of degradation, which is exposed to the electrical product in a production environment. The students		1
	duct for a model operating environment. The student should try to verify the dominant degradation process of the product in the laborat	ory or perform its	computer
simula	ation. Attention is also paid to environmental aspects associated with the choice of materials (technology) that are able to limit the degr		
xP13DFD	ation. Attention is also paid to environmental aspects associated with the choice of materials (technology) that are able to limit the degration. Data and Functional Analysis of Production Systems		4
XP13DFD		adation process.	4
XP13DFD Technological system Methodology of an	Data and Functional Analysis of Production Systems  em of production enterprise and its structure. Relationship of technological system to other 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 date	Z,ZK nterprise, distribute a and material flo	4 ted systems ws analysis
XP13DFD Technological system Methodology of an	Data and Functional Analysis of Production Systems  em of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of dat sis of user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise. Us	Z,ZK nterprise, distribute a and material flo	4 ted system ws analysi
XP13DFD Fechnological system Methodology of an Methods of analys	Data and Functional Analysis of Production Systems  em of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of date sis of user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise. Us enterprise. Documentation and standards for data and functional analysis. Automation of analysis methods, CASE tools.	Z,ZK nterprise, distribu a and material flo	4 led system ws analysi analysis o
XP13DFD Fechnological syste Methodology of an. Methods of analys  XP13DTF	Data and Functional Analysis of Production Systems  em of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of dat sis of user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise. Us	zadation process.  Z,ZK  nterprise, distribut a and material flot e of Petri nets for  Z,ZK	4 ded system ws analysi analysis o
XP13DFD Technological system Methodology of and Methods of analys  XP13DTF	Data and Functional Analysis of Production Systems  em of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information of en lalysis of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of dat sis of user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise. Us enterprise. Documentation and standards for data and functional analysis. Automation of analysis methods, CASE tools.  Thin film diagnostics	zadation process.  Z,ZK  nterprise, distribu a and material flo e of Petri nets for  Z,ZK : optical methods	4 ded system ws analysi analysis o
XP13DFD Technological system Methodology of and Methods of analys  XP13DTF	Data and Functional Analysis of Production Systems  em of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information of en lalysis of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of dat sis of user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise. Us enterprise. Documentation and standards for data and functional analysis. Automation of analysis methods, CASE tools.  Thin film diagnostics  terization. Definition of a thin film. Deposition methods; chemical vapor deposition, physical vapor deposition. Thin film characterization	zadation process.  Z,ZK  nterprise, distribu a and material flo e of Petri nets for  Z,ZK : optical methods	4 ded system ws analysi analysis o
XP13DFD Technological system Methodology of and Methods of analys  XP13DTF Surface charact  XP13FCD The course discuss	Data and Functional Analysis of Production Systems  em of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of dates is of user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise. Usenterprise. Documentation and standards for data and functional analysis. Automation of analysis methods, CASE tools.  Thin film diagnostics  terization. Definition of a thin film. Deposition methods; chemical vapor deposition, physical vapor deposition. Thin film characterization diffraction. Ion implantation. X-ray diffraction and photoelectron spectroscopy. Thickness, mechanical, optical and electrical proper Photovoltaics systems  ssess the most important problems of principle, technology of production and final use of photovoltaic systems for power generation. To	zadation process.  Z,ZK  nterprise, distribu a and material flo e of Petri nets for  Z,ZK c optical methods erties.  Z,ZK pics: Solar energ	4 led system ws analysi analysis o 4 g electron 4 y and basic
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XP13SID	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, d	atabase and CA	AD, examples
VD40C ID	of software systems. Introduction to user interface based on Microsoft Windows.	7 71/	
XP13SJD	Quality Control Systems	Z,ZK	4 experiments
	ity and reliability. Basic quality management systems. 130 9000, rigin, Kalzen. Basic characteristics of 130 9000. Quality management system a ility. Mathematical model based on factor experiments. Optimization of mathematical model. Six Sigma quality management system a		-
•	igma system. Reliability as a subset of quality. Mathematical distributions used in the field of reliability. Usage and maintenance coeffi	•	
100.0 0. 10 0 0.	mathematical description. Accelerated reliability testing. Processing and analysis of experimental data.	ololli Baollap	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
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 deadloc	•	1
	in control of technological systems.	3	,
XP13SSD	Special Methods of Devices Quality Evaluation	Z,ZK	4
	e principal values determining the quality of the passive and active devices. Measuring methods, their evaluation, identification of systems	,	e description
of the tested device	ice, two ports parameters of the device. Matching of the device to the measuring circuit. The noise of the electronic circuits, optimal no	oise and power i	matching.
	Non-linearity of the "linear" circuits, intermodulation distortion, measuring of the non-linearity and intermodulations.		
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		
ŭ	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 conter	nporary trends i	n industrial
\/B.(.==\).	microcomputers.		
XP13TND	Technology of Low Temperatures and Superconductivity	Z,ZK	4
	inciples of cooling. Equipments for achievement of low temperatures, liquifiing of gases. Ultralow temperatures. Properties of isotopes		
	es of solids at low 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 temperatu	-	_
лопотпена. Ртореги	and work in low temperature laboratory. The use of low temperature technology in practice.	a c a cimoined y	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
XP13TPD	Technological Processes in Electronic Manufacturing	Z.ZK	4
	inology of packaging. Contemporary methods of packaging of components SOP, DIP, SIP, ZIP, QFP and others, properties, advantages	,	1
•	ie viewpoint of environmental resistivity. Classification of multichip modules. Multichip modules of different types: MCM-L, MCM-C, MC	_	
	Technology of contacting og dies. Electrical design of MCMs. Thermal design of MCMs. Physical design of MCMs. Parameters for eva		
·	of MCMs. Design tools. Programmable modules. Applications of MCMs.		•
XP13VNM	Research of new materials	Z,ZK	4
he course will cover	r the topics of materials such as Piezoelectrics, pyroelectrics and ferroelectrics without lead, Multiferroics, Special magnetic elements, c		s and carbor
nanomaterials, Bio-in	nspired materials and hybrid organic inorganic materials, Polymers and composites containing polymer for electrical engineering, Nai	nofibers. Metals	(ODS HEA
			( 000, 112, 1
• •	lled content of amorphous / crystalline / nanocrystalline mass, Metals with extreme dependence of electrical resistance on temperatu	re, mechanical l	oad and its
• •	lled content of amorphous / crystalline / nanocrystalline mass, Metals with extreme dependence of electrical resistance on temperaturial behavior, Carbides and nitrides (MAX phase). Critical methods for study of these materials will be discussed - Characterization of	re, mechanical l	oad and its
influence on materi	ial behavior, Carbides and nitrides (MAX phase). Critical methods for study of these materials will be discussed - Characterization of niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance	re, mechanical l materials by diff	oad and its raction and
influence on materi- spectroscopic techr	ial behavior, Carbides and nitrides (MAX phase). Critical methods for study of these materials will be discussed - Characterization of niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedance simulation of temperature and el. fields.	re, mechanical le materials by diff ce analyzers, Mo	oad and its raction and odeling and
influence on materi spectroscopic techn XP13VTK	ial behavior, Carbides and nitrides (MAX phase). Critical methods for study of these materials will be discussed - Characterization of niques, Characterization of materials by microscopy (SEM, TEM, polarized light, confocal), Characterization of materials by impedant simulation of temperature and el. fields.  Vacuum technology and cryogenics	re, mechanical l materials by diff ce analyzers, Mo Z,ZK	oad and its raction and odeling and
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XP13VTK Physics of gas. Volum of real equipments temperature therm XP13VVM Research of comp  XP14APD New trends in developments in developments in developments.	ial behavior, Carbides and nitrides (MAX phase). Critical methods for study of these materials will be discussed - Characterization of 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 nometry. Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum to Development and Research of Materials  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.  New Trends in Electric Device Applications  lopment 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 swi	re, mechanical I materials by diff ce analyzers, Mo Z,ZK of cooling and of ms used in cryotechnology and of Z,ZK thick conductive ZK ristics and their i	and and its raction and odeling and odelin
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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.	hnologies in the m	anagement
XP16ERU	Accounting	ZK	4
	nting. International accounting standards (IFRS). Methodology of accounting. Cost, revenues, profit and cash flow. Balance sheet, pro	ı	nt. Analysis
	of company's financial position.		•
XP16FIM	Financial Management	ZK	4
Principles of financ	e, 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 term	n finance, cash flo	w finance.
XP16FVT	Philosophical Problems of Science and Technology	ZK	2
_	ged in the evolution of principal ideas on which the science and technology are founded. Philosophical aspects of physics and mathe	•	examined.
	Actual themes linked to the so called "Postmodernism" and to the alternative ways of understanding and their social coherences are		
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
Quality assurance	in the organization. Statistical methods in quality management. Models of quality systems. Economic issues in quality assurance. Imp	olementation of red	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	vare SPSS for advanced statistical methods as multiple regression and correlation, analysis of variance, factor analysis, cluster analy	sis and its using in	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		iour.
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	nd portfolio.
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Product and service policy, pricing and contractation policy, communication, distribution. Marketing mix.		
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	avantage.
XP16MAU	Case studies in the field of product policy, price and condition policy, communication policy and distribution policy.	ZK	4
	Accounting for management anagerial accounting. Relations to the organisational structure of the enterprise and to the production process. Budgets, use for mana		4
The philiciples of th	analyses. Productivity and measurement of productivity in the production process. The managerial information systems.	Jement. Calculatio	ilis aliu cost
XP16MAV	Production Management	ZK	4
	ion 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.		71 07
XP16MES	Economics and Management of Energy Systems	ZK	4
Strategic questions	of electric power sector, gas systems and central heating systems functions. Marginal revenue in electric power system. Marginal cost	sts of electricity, he	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 of	cooperation
	in power industry. Energy price regulation and its consequences		
XP16MEU		ZK	4
Organizational stru	cture of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and tariffs of	energy. Governme	ntal energy
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	policy. Development of international cooperation in power industry and its economic and ecology aspects.		
XP16MVE	Selected Problems of Economy and Management of Energy	ZK	4
i ne roie of product	ion process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning with re Standardized basis of production management, standardization. Controlling, production management methods.	spect to production	on typology.
XP16SDE	Building heritage of the industrial era	NIC	2
		ZK	4
XP16STM	Selected Statistical Methods s.Transformation of random variables.Aproximation of theoretical distributions.Interval estimates.Hypothesis testing.Simple and multip		
Descriptive statistic	series.Index number.	le regression. Anai	iyələ ol tillic
XP16STV	Product Strategy	ZK	4
	vice policy, pricing and contractation policy, communication, distribution. Marketing mix. Inovations. Concepts of marketing strategy. R		
	management. The strategic marketing simulation Markstrat.		
XP16VPB	Science, Technology and Industrial Boom	ZK	4
XP16VTK	Everyday Science and Technology	ZK	4
XP16VTS	Development of Technical Universities	ZK	4
XP16ZVP	Fundamentals of Scientific Work	ZK	4
XP17ANS	Selected Chapters from Antennas and Propagation	ZK	4
	nas and modern antenna technology. Selected problems of antennas and propagation for fixed and mobile communication, earth and	l l	=
=	different services and communication. Topics of near a far field antenna measurement, compact antenna measurement. Measureme		
	services. Antenna anechoic chambers design.		
XP17APL	Applied Optoelectronics in Medicine	ZK	4
Coope and sime			
-	of non-invasive measurement techniques in medical diagnostics. Fundamental physiology of the vascular system, hemodynamics, si		
-	on of the cardiovascular system. UV, VIS and IR spectroscopy. Fundamental optics of the eye and color analysis. Optical parameters of	of biological tissue.	
-		of biological tissue.	

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. Details of microwave thermotherapy apparatus are given, especially from the point of view of applicators for local, intracavitary and regional treatment. Non-invasive thermometry (NMR, ultrasound and radiometry) and special compatible applicators are described.					
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				
circuits with the	stress on methods: spectral domain, integration equation, finite differences, finite elements, mode matching, transversal resonance. S electromagnetic fields, moment method, disturbance method.	Survey of basic the	orems of		
XP17MT	Microwave Technique ission lines and its circuit elements including hybrid and monolithic integrated circuits technology. Resonators and other type of passi	ZK	4 nents (e.a.		
	olers, isolators and circulators, modulators etc.) and active microwave circuits (e.g. oscillators, mixers and amplifiers), microwave filters		1		
	CAD of microwave circuits.	-,			
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	le Matching Techni	que, Point		
Matching Method, N	Method of Moments, Multiple MultiPoles, Boundary Element Method, Finite Difference Method, Finite Element Method, Finite Integration	on Method. Stability	of solution.		
Solution	of matrix equations: direct methods, Gauss-JordanOs elimination, pivotation, LU-decomposition, banded and sparse matrix, conjugation,	te-gradient method	i.		
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, o	optical fibers meas	urements,		
	fabrication, nonlinear phenomena in optical, fibers, fibers for sensors.				
XP17PEM	Advanced Electromagnetism	ZK	3		
•	ts advanced topics of classical electromagnetic field theory, especially: electric and magnetic vector potential; reciprocity, duality, and				
function; multipole	expansion; scattering and characteristic modes; homogenization and Bloch's theorem; synthesis and topological optimization The known and bloch's theorem; synthesis and topological optimization The known and the state of applied electromagnetic processing and the state of applied electromagnetic processing and topological optimization.	owledge gained in	this course		
VD4ZTANA	can be used in many branches of applied electromagnetism, especially in antenna theory and microwave circuit design.	71/			
XP17TAM	Evaluation of Applicators for Microwave Thermotherapy sed on methodology of evaluation of microwave applicators, which means measurements of SAR distribution in water phantom and n	ZK	4		
	ous types of agar phantoms. Further design and optimisation of measuring probes is discussed, methodology of probes calibration a				
	lescribed. Numerical modelling of microwave applicators by aid of software product FEMLAB, comparison of mathematical and exper		Ovaldation		
XP17TOM	Theoretical Optoelectronics in Medicine	ZK	5		
	o doctoral students from different disciplines the opportunity of both highly theoretical studies and numerical simulations of interaction				
the visible part of th	ne spectrum (and adjacent UV and IR bands) with biological tissues. And to learn about modern optoelectronic sensor concepts and t	their applications in	the field of		
medical therapy a	and diagnostics. Interdisciplinary topics will be discussed and focused on the benefits and current applications of optoelectronics in mo	edicine. Important	definitions		
(such as radiation	n intensity, etc.) will be formulated and important methods will be described, in particular: radiometry, photometry, eye as a radiation of	detection field. UV,	VIS, NIR		
	ferometry, 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 I methods FDTD, FEM, MoM, Monte-Carlo etc. Operating principle of the optoelectronic reflective and transmissive sensors. Measurei	•	are working		
	i metrodo i BiB, i Em, monte dano ete. Operating principie di trie optodicettorile reflective and transmissive sensors. Medisarci	ment concents for i	noninvasive		
detection of perion	eral blood volume dynamics, clinical examples and typical examination tests. Principles and applications of functional optical imaging	•			
	eral blood volume dynamics, clinical examples and typical examination tests. Principles and applications of functional optical imaging anoscopy, IR thermography, Laser Doppler perfusion imaging (LDPI), Photoplethysmo-graphy imaging (PPGI), optical coherence ton	techniques: optica			
	anoscopy, IR thermography, Laser Doppler perfusion imaging (LDPI), Photoplethysmo-graphy imaging (PPGI), optical coherence to	techniques: optica			
Diaph XP17TVC		techniques: optica nography (OCT).	l biopsy, IR		
Diaph XP17TVC Design of highly	anoscopy, IR thermography, Laser Doppler perfusion imaging (LDPI), Photoplethysmo-graphy imaging (PPGI), optical coherence ton  Technique of Highly Sensitive Receivers	techniques: optica nography (OCT). ZK h atmosphere and	d biopsy, IR  4 surface.		
Diaph XP17TVC Design of highly Microwave, millimet meas	Technique of Highly Sensitive Receivers  respectively. Sensitive Receivers  respectively. Sensitive Receivers  respectively. Sensitive microwave receivers, mm - wave and submm - wave receivers. Electromagnetic spectrum and noise properties of the Earth tre wave communication. Semiconductors for microwave and millimetre wave bands, SIS detectors, mixers, infrared receivers. High frequencement of noise parameters. Multispectral radiometry and remote sensing, electromagnetic radiation - interference, EMC theory and	techniques: optical nography (OCT).  ZK h atmosphere and uency radiometers d measurement.	4 surface. technology,		
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XP31NOS	Design and circuit structures of electronic systems	ZK	4
	with important applications of analogue technique. The subject is divided into the three basic parts. The first part is devoted to amplifier	_	
	and signal processing. Special application amplifiers, nonlinear and parametric analog functional blocks and fast analog circuits opera	•	
	cond part is devoted to linear analog systems, their characteristics, description and synthesis capabilities. There are discussed: the ty thods of filter synthesis and their optimization with regard to real properties and value variances of the circuit elements, implementation	-	
	rs, i.e. switched capacitor (SC) and switched-current (SI) circuits. The last part deals with computer-aided circuit design. The principle:		_
	g models of functional blocks and circuit elements are discussed together with simulation result processing and their utilization for circ	•	•
XP31TSS	Signal and system theory	ZK	4
	sformations - Laplace and Z-transforms, Fourier transform, cepstra, wavelet transforms. Signal parameterization - AR, MA, ARMA modulas in the street of the		
XP31ZBS	Biological Signal Processing	ZK	4
The course deals v	piological Signal Frocessing with the processing of biosignals and advanced methods of processing resulting from current research in solving common projects in coal faculties, institutes of the ASCR, foreign universities). The subject concept allows us to respond flexibly to new directions and know	ooperation with top	·=
XP32AKR	Applied Cryptography	ZK	4
	propried of yptography. Mathematics Foundations of Cryptography. Related Problems of Number Theory. Public Key Parameters. Pseudorandom I		
	ners.Public Key Enciphering. Hash Functions and Data Integrity. Entity Identification and Autentication.Digital Signatures. Key Manageme		
	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
The course familia	rizes students with evolution and standardization of mobile networks and mainly provides a detailed description of network architectures	and discusses bas	ic principles
	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		
Method, Boundary	Element Method and Finite Element Method. Handling the software is obvious nowadays; nevertheless, the mayor attention is paid to understanding the physical principles of the polyadate is graphical to particular used a	_	athematical
VP000PV	background of the used apparatus and understanding the physical principles of the solved tasks in symbiosis to particular used s		
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 designs, 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		
res	earch and development projects. Motto: Those who do not protect the results of their research work can never dream of being on par	with the best	
XP32OSY	Optical Systems	ZK	4
	ion systems are being more extensively used in a practice, particularly in a telecommunication networks. Tremendous transmission ca		
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 f function.	ber and transmissi	ion systems
XP32RTS	Telecommunications Systems Management	ZK	4
Telecommunication	s Systems Management is a discipline which deals problems of interactions of technical and business aspects of management of telescopic services provided.	ecommunication ne	etworks and
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). Intro		· -
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 difference of the QT are applied on the QT are applie	erent service syste	ms and
telecommunication	networks deploying and operating at time being. Theoretical knowledge about models of service systems can be utilized for dimensioni in real life - not only in the telecommunication.	ng of different serv	ice systems
XP33BID	Bionics	ZK	4
Relationship: bio	logy + technology = bionics. Bionics Classification. An overview of biological principles and its technological parallels: reproduction, gi	owth, movement, i	breathing,
	tion, excrementation, thermoregulation, vision, hearing, taste, smell, sense of touch, speech, memory. Neural and neuronal systems. I		
	ics. Information transfer in biotechnological systems. Biosystems modelling. Biosystems diagnostics. Orientation and navigation. Fund		
external substitute	s, bioprotheses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems. Intelligent input and for creative thinking.	output filters. Sup	port system
XP33CHM	Chapters in higher mathematics	ZK	4
	ts of several deeper results in a few mathematical disciplines. The idea is to help a student to read, with a certain comfort, the monog		
	contents of the course are fundamental results (principles) of nowadays mathematics. More specifically, the course concerns the Sto		
	(as applied in mathematical logics and probability theory), the Banach fixed-point theorem for complete metric spaces (as applied in	-	
Tychonoff theorem	$on \ compact \ spaces \ (as \ applied \ in \ measure \ theory), \ the \ Riesz \ representation \ theorem \ for \ linear \ forms \ in \ a \ Hilbert \ space \ (as \ applied \ linear \ forms \ in \ a \ Hilbert \ space)$	n the optimization	theory), the
Brower theorem for	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
	2023/24 the course runs for the last time. In future years, it will not be opened anymore. Distributed problem solving. Multiagent planni		
	Communication strategies, message passing. Various AI approaches, case studies. Types of agent behavior. Negotiation. Organizatio board systems. Client-server systems. Peer-to-peer systems. Implementation aspects of distributed knowledge-based systems. Learr	_	-
	Meta-agent. Agents acquitance models, social knowledge, reflectivity in MAS. Coalition formation, team work. Formal models of agent		yotomo.
XP33ECD	Evolutionary Computing	ZK	4
	lutionary computing in contrast to classical computing techniques, Genetic algorithms (GA) for optimisation. The Simple Genetic Algo		
GA Convergence,	negative phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typical ta	sks, GP and machi	ne learning.
	GA and GP applications. Special methods for improving GA performance.		
XP33FLO	Fuzzy Logic	ZK	4
	Basics of fuzzy sets and fuzzy logic. Measures on collections of fuzzy sets. Principles of fuzzy control.		
XP33GAD	Geometrical Algebras	ZK	4
Algebraic structu	res used in geometry: Groups and linear spaces, ordered groups and fields, othogonal groups, Clifford algebras, etc. Discussion of po	tentital application	s in image
		toritia approation	- 3
VDOOLOT	processing.		
XP33ICT		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 vario	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
	notions of statistic and probability. An analysis of the notion of non-deterministic algorithm. Effectivity criteria for non-deterministic algorithm.		
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.
VDOODAM	Probabilistic algorithms and their practical importance.	71/	4
XP33PAM	Industrial application of multi-agent systems	ZK 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		
	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
	res present a mathematical tool for uncertainty (randomness) quantification and processing applying the notions and apparatus of the	-	-
	ibilistic 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	· · · · · · · · · · · · · · · · · · ·	-
octo ana, in parti	measure and probability theory.	attice tricery or tric	Staridard
XP33PPD	Practical Data Mining Problems	ZK	4
The course is focus	bed on solving of practical data mining problems. Lectures deal with data transformation, pre-processing and verification, selection of a	suitable data minir	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		=
zo.o.n 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
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 v	with questions, cor	mments and
	discussion about the paper.		

XP33RG2			
	Reading Group	ZK	4
This is a reading gr	roup 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
	t Mobile Robots. Known Control Architectures. Top-Down and Bottom-Up Approaches. Overview and Comparison. Distributed Autonom		1
-	ghbourhood Mapping. Needed Sensors. Ground of Ethology. Imprinting. Taxe. Stimuli, Receptors. Multiple Motivated Behaviour. React		_
Integration. Comn	nunity Robots Structure. Task- or Behaviour-Oriented Robots. Ways and Realisation of Robots Co-operation, Motivation, Observation	Perception, Con	nmunication
	Iti-Agent reinforcement Learning. Q-Learning. Action Selection Mechanism, Learning Method, Exploration Strategy. Emotional Learning.		Approach to
	thetic Biology. Artificial Life. Virtual World Different Approaches. Robots Competition, RoboCup, Strategy Selection, Implementation. C	-	1 4
XP33ROD	Pattern Recognition See https://cw.fel.cvut.cz/wiki/courses/xp33rod/start	ZK	4
XP33ROZ	Selected Topics in Pattern Recognition	ZK	4
Prerequisites: bas	sic course in pattern recognition (e.g. P33ROD, 33RPZ). Selected topics: Anderson's problem, Kozince algorithm, kernel perceptron, r	nonlinear Fisher o	discriminant.
Vapnik's learning	theorz. Deterministic learning. Unsupervised learning: Robbins algorithm and emprirical Bayesian approach. Expectation-minimization	_	cognition of
VDOODOV	sequences and directed acyclic graphs. Markov models. Combination of weak classifiers: boosting and bagging. AdaBoost		
XP33RSK	Robust Statistics for Cybernetics  ds are basic tools of control and decision making theory. Classical statistical methods (e.g. MLE) are usually very sensitive to deviatio	ZK	4
	ds which are robust have been developed. It means that these methods are not so sensitive to small deviations from an underlying m		
•	cept of estimation and then we introduce the robust approach, some basic robust estimators of location (e.g. trimmed mean, Hampel e		
•	robustness (influence function, breakdown point).	,	
XP33RSP	Management of Software Projects	ZK	4
XP33SCD	Man-Machine Systems	ZK	4
=	chine systems development. Human operator tasks. Manual control, supervisory control cognitive control. Typical structure of a control s	=	-
	operator and machine. Control levels after Rasmussen. Skill based, role based and knowledge based operator behavior models. Fuz		
Operator psycholog	gy. Mental models. Human-machine interaction. Intelligent interface. Factors influencing operator behavior. Stress. Mental load. Human system reliability. Man-machine systems simulators. User-centered system design.	error detection.	vlan-machine
XP33SDD	Discrete Event Systems	ZK	4
	crete event systems. Modeling of discrete event systems, GRAFCET and it is applications with practical examples. Petri nets overview		1
	stems. 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
	ility measures can be sen as an alternative mathematical model for uncertainty quantification and processing, topical and intensively	-	-
are based on th	ne maxitivity principle replacing the additivity principle applied in the classical measure theory. Besides the real-valued possibilistic me	asures also non-	numerical
VDOOTTM	possibilistic measures taking their values in complete lattices will be introduced and analyzed.		
XP33TTM	Text mining		4
VECOLUE	Ţ.	ZK	4
XP33UID	Artificial Intelligence	ZK	4
Basic terminologica	Artificial Intelligence al issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, sta	ZK ate space search.	4 Admissibility
Basic terminologica and informedness o	Artificial Intelligence	ZK ate space search. f knowledge base	4 Admissibility
Basic terminologica and informedness o	Artificial Intelligence al 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	ZK ate space search. f knowledge base	4 Admissibility
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Basic terminologica and informedness of acquire XP33VID Introduction to per motion. The stereos Surface model r	Artificial Intelligence al issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, state of the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of sition, induction from examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of pa  3D Computer Vision  spective geometry, perspective camera. Fundamental and essential matrices, their robust estimation, camera calibration. Correspond scopic vision problem, cyclopean representation, disparity, disparity gradient limit, ordering constraint, four basic formulations of the dereconstruction from stereovision, error propagation, examples. Physics of image reflection, image irradiance equation, basic reflectances.	ZK ate space search. If knowledge base ttern recognition. ZK lence problem, st inse corresponde the models. The si	4 Admissibility s. Knowledge 4 rructure from nce problem hape from
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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
	ule 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 solves shows appropriately application of integrated migra companyons.		
	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	_	
	uding 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, biomedi	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		
	of to. Design and preparation of dielectric and polymer waveguides and structures. Optical waveguide gratings, r assive waveguide str and 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 now possibilities of realization 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	_	
	uding 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, biomedical	cine, aerospace,	automotive
	industry etc.		
XP34MSY	Microsystems	/1/	4
Fundamental sans	ante and elegation of micropystome Micro concern Micro actuators Signal processing within the system MEMS (micro electrical m	ZK	I
	epts and classification of microsystems. Micro-sensors. Micro-actuators. Signal processing within the system. MEMS (micro-electrical- pectrical 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- ectrical structures). MEMOS (micro-electrical-mechanical-optical structures). Microsystem design. Microsystem modelling. Manufacturi Industrial applications. Medical applications.	nechanical struct	ures). MOES
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Micro-optical-electrophotomates and interpretation of the control	Retrical structures). MEMOS (micro-electrical-mechanical-optical structures). Microsystem design. Microsystem modelling. Manufacturi Industrial applications. Medical applications.  Materials and Technologies for Photonic Devices and Structures cquainted with optical materials such as semiconductors, optical glass, crystals, and polymers. The students get acquainted also with te belectronic devices and structures. It will be present technologies for deposition of the micro and nano layers deposition. Students will be twill be shown principles of integrated optoelectronic devices and structures. It will be also shown the design of the photonic structure the measurement of the optical and optoelectronic properties.  Optical Radiation Detection and Detectors  Optical Radiation Detection and Detectors  Optical Radiation Detection and Detectors  magnetic radiation, radiometric and photometric units. Detection of optical radiation, Ideal detectors, internal and external photo-effect. Enternal photo-effect detectors, PN junction. PIN photodiode, physical principles, properties. Avalanche photodiode, physical principles, properties. Avalanche photodiode, physical principles, properties. Avalanche photodiode, physical principles, properties. Measurement methods, applications.  Advanced Electronic Devices  seering. Quantum well, wire, point. 2D electron gas based devices (HEMT, MOD FET). Devices based on resonance double-barrier tune is (memories, generators, multipliers). Heterogeneous structures. Microwave devices, HBT, Gunn diodes. Microwave device application with internal optical coupling. Cryotronic devices. Recording media. IC development trends.  Programmable IC Design  urse is to acquaint students with advanced methods of design, synthesis and verification of programmable systems and systems with the basic building elements, architecture and design procedures used to implement complex integrated systems, methods of describin I learn verification strategy, design and analysis of tests. This project-oriented course	ZK echnologies for the periodic properties. Photo al receivers, designations. Heterogeneous implement a coolement methods, nethods and technologies and optoelectronic and openiconductor technologies.	wres). MOES Materials.  3 ne fabrication new modern methods for  4 net detectors, no-resistors, gn principles, 4 nes. Quantum nus devices  4 non the chip. dedures their mprehensive  4 B structures. ne stability. nerent diodes applications. nologies. 3 ic structures. iconductor ptoelectronic thnology. The
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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		1
ound quality, introd	duction to acoustics of speech and singing, physicalacoustic principles of musical instruments, tuning, dynamics, timbre of the tone, to	adiation properti	es of music
	instruments, introduction to methodology of measurement of musical instruments.		
XP37FOS	Photonic Imaging Systems	ZK	4
	resentation. 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,		
letection systems	s. 2D transfer systems and their signal distortion, image aberration and their correction, toleration analysis of optical system. Receivers	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		-
	olace in the specialized departmental laser lab for limited number of participants. Selected experiments will also be presented during le		•
	purchased under the project frame will be exploited.		
XP37FZS	Fuzzy Signal Processing	Z,ZK	4
	ation and their research activities are focused on the problems of utilize fuzzy logic and neural network for optimization algorithm used a	•	al processir
	as adaptive filtration, diagnostic of the signal, control phase lock and so on.		
XP37GAB	Genesis and Analysis of Biosignals	ZK	4
ne subject deals w	with genesis and description of the most important biological signals of both electric and non-electric nature. Properties of the biosignal, of the biosignal, of the biosignal	essential for the o	onsequenti
signal pr	ocessing, are studied. Finally, simple and advanced methods of biosignals pre-processing, analysis and evaluation are presented for	each the biosign	al.
XP37IAR	Implementation algoritms in radioelecronics	Z,ZK	4
	ucation and their research activities are focused on the problems of effective implementation algorithms in radio electronics by signal		
more arithmetic	units (universal and signal processors) and with support hardware accelerators in FPGA circuits. Optimization of the algorithm is con	centrate on mini	malisation
	computational complexity by utilization multirate digital signal processing and hardware accelerators.		1 .
XP37IPP	Image Processing and Photonics	ZK	4
	c discipline used in space technology. Students will become acquainted with advanced imaging photonics used in space sciences, include the control of the co		
-	nts and the influence of the environment. In addition, there are included parts describing the parameters of optical instruments (PSF, Neformation modeling and removal methods for IR - VIS electromagnetic radiation. The subject also includes a description of the senso		
**	nd the reconstruction of the acquired image, and discusses its use in space applications. In addition, there are parts including Earth Rer		
= -	lern instruments in this area, including optical Fourier transform, electromagnetic wave polarization research, and hyperspectral imagin	_	_
	area, including image data telemetry.	ig and data proc	000g
XP37ISS	Introduction to space science and technology	ZK	4
1	space sciences and technology on PhD level. Methods and resources of space research and their applications. Satellites, space prob		1
		es, space station	ns, space
transportation sy	stems, their development, proposals and design. Optoelectronic systems for space, onboard systems and payload, space communic		=
		ation and navigat	ion, space
	stems, their development, proposals and design. Optoelectronic systems for space, onboard systems and payload, space communications are specifically spaced to the space communication of the spaced systems are spaced to the spaced systems.	ation and navigat	ion, space
	stems, their development, proposals and design. Optoelectronic systems for space, onboard systems and payload, space communication ology. Remote sensing and multispectral images, applications. Space physics, cosmic environment, cosmic radiation and particles.	ation and navigat	ion, space
naterials and tech	stems, their development, proposals and design. Optoelectronic systems for space, onboard systems and payload, space communication of space systems and multispectral images, applications. Space physics, cosmic environment, cosmic radiation and particles. Of space systems, space software, archiving and data reduction, organization international co-operation.	ation and navigat Ground based se	gment, tests
XP37LN XP37MPS	rstems, their development, proposals and design. Optoelectronic systems for space, onboard systems and payload, space communication in space sensing and multispectral images, applications. Space physics, cosmic environment, cosmic radiation and particles. Of space systems, space software, archiving and data reduction, organization international co-operation.  Aircraft Navigation	ation and navigate Ground based se ZK ZK	gment, test
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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. Metrological	al reliability. Statistic	cal analysis
of measurement data.	71/	4
XP38MPX   Magnetism in Engineering Practice Students will be introduced into the magnetic materials, magnetic sensors and engineering magnetism including FEM design and magnetic measureme	TK ZK	4 content of
this advanced course can be modified according to the students' needs.	nis and testing. The	o contont of
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-frequence	ncy field and with m	nethods for
pasic processing of system data. The course includes a detailed description of aircraft instrumentation and its resistance to external influences, a descri	•	
and power electrical engineering, analysis of instruments and systems for measurement of engine and aerometric quantities, and a description of emergene It thus develops the background related to nowadays technology and methodology utilized on aircraft. The course provides a detailed overview of quanti		·
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	ZK	2
XP38SSA	ZK	3
The course is focused on advanced sensors and data communication principles within heterogeneous automotive networks. It especially deals with m	odern wideband au	utomotive
sensors communication over the internal vehicle communication infrastructure.	71/	4
XP38SSB   Sensors and Buses The student will be introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical principle	ZK	4 d important
parameters, the concept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration and diag	= =	
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		
he integration of systems for data acquisition and process control. Laboratory exercises are designed in part in the form of classical tasks, partly in the f	orm of problem-orion	ented tasks
in the field of programming of automated measurement systems and control of measurement processes.  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 process advanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, and process advanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, and process advanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, and process advanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, and process advanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, and process according to the context of the condition of the conditio		-
of non-destructive testing, the corresponding advanced signal processing, and self-acting evaluation in order to improve reliability, availability, mai	•	
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 s		- 1
levices for measurement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC mea Inalyzers, metallic and optical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement metho		
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.	1	
transformation (except Fourier), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality inc		
transmission, etc.		
XP39CG Advanced Computational Geometry	ZK	4
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 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 method		
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		-
theoretical character, invites directly to the above-defined concept.		
XP39PMV Advanced Methods of Visualization	ZK	4
Scientific visualization based on physical models. Scientific visualization and volume rendering. Volume graphics. Information visualization. Interactic environment. Scientific visualization in WWW environment. Particle models and visualization of technological processes. Computational		alization
XP39SCG Seminar in Comnuter Graphics	ZK	4
The Seminar in Commuter Graphics will make students familiar with selected research topics from computer graphics srrch aq efficienf renderino methr		
fheir nntical nronerties qimrrlafinn of nhvqical nhennmena or geometrical modeling and animation. The course rvill also include graphics methods used		
mage processing, computer vision, and human computer interaction. The goal ofthe 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 connections and the same as the sam	ection with the aim	of using the
gathered knowledge to solve specific problems of their PhD theses.	7.71/	4
XP39SPG   Computer Graphics Seminar  The computer graphics seminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface materi	Z,ZK	-
simulation of natural phenomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used in relate	•	
image processing, computer vision and human computer interaction based on the particular topics of PhD theses of the participating students. The goa	al of the course is to	introduce
the selected topics to the students and by analyzing selected highly influential research publications to further develop the research capabilit		
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 Jain theoretical background related to human interaction in such environments. During the course students will get familiar with a set of techniques for d	-	
systems in non-standard environments, especially in virtual and augmented reality with collaborative aspects.	ssign and testing of	i iiiteractive
XP39VIZ Advanced Visualization Methods	ZK	4
luman factors in visualization (Perception and cognition, Visual saliency, Visual thinking) Design of User Interfaces for Visualization applications (Evaluation)	ion of visualization t	
Advanced volume visualization (Illustrative volume rendering) Big data visualization, Visual analytics, Animation for visualization, Data compression an	d reduction Large s	scale data
visualization Visualization techniques in nonstandard environment	71/	4
XP39VPG   Computational Geometry  Principles of computational geometry (CG), data structures and paradigms, methods of geometric search, convex polygons and hulls, applications of co	ZK Z	4 v problems
/oronoi diagrams, triangulation, efficient intersection algorithms, intersection of semispaces and polygonal regions, geometry of rectangles, dual mappin		
dual space, algorithms of computer graphics and CG. Students who completed course 36VGE cannot enroll.	5 -1, 00	
XP39VR Virtual reality	ZK	4
Advanced methods in the VRML language. Standard and non-standard extensions to the VRML language. Programming of external applications with E		user virtual
reality. Distant cooperation in virtual environment. Hardware and software support for virtual reality systems. QuickTime VR. Specific	ation X3D.	

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).

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