## Study plan

## Name of study plan: Doctoral studies, structured daily studies

Faculty/Institute/Others:
Department:
Branch of study guaranteed by the department: Welcome page
Garantor of the study branch:
Program of study: Welcome page
Type of study: unknown full-time
Required credits: 30
Elective courses credits: 20
Sum of credits in the plan: 50
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: 30 The role of the block: S

Code of the group: XPKKPPP

Name of the group: Doctoral subjects XPkkppp

Requirement credits in the group: In this group you have to gain at least 30 credits (at most 50)

Requirement courses in the group:

Credits in the group: 30

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members)	Completion	Credits	Scope	Semester	Role
XP02AMA	Tutors, authors and guarantors (gar.)         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 Libor Husník (Gar.)	Z,ZK	4	2P+1S	L	S
XP37APF	Acoustics and Electroacoustics of Solid State	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
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
XP04A2ZK	English language 2	ZK	0		Z,L	S
XP04A2	English language 2 Petra Juna Jennings Petra Juna Jennings (Gar.)	NIC		4C	Z,L	S
XP34AT	TCAD Tools Applications Jan Voves Jan Voves Jan Voves (Gar.)	ZK	4	2P+2C	L	S
XP32AKR	Applied Cryptography Tomáš Van k <b>Tomáš Van k</b> 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 (Gar.)	ZK	4	2P+2S	L	S
XP31ART	Architectures for Real Time Implementation	ZK	4	2P+2S	L	S

XP33BID	Bionics	ZK	4	2P+2S	Z	S
XEP35CMS	Computational Methods for Materials Science	Z,ZK	4	2P+2C	Z,L	s
XP04 1	Antonio Cammarata Antonio Cammarata Antonio Cammarata (Gar.) 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	ZK	4	2P+2S	Z	S
XP36RGM	Pavel Sovka Reading group in data mining and machine learning	ZK	4	2P	Z,L	S
XP13DFD	Ji í Kléma, Filip Železný Filip Železný Ji í Kléma (Gar.) Data and Functional Analysis of Production Systems	Z,ZK	4	2P+2S	L	S
XP34ORD	Martin Molhanec           Optical Radiation Detection and Detectors	ZK	4	2P+2C	L	s
XP36DRO	Václav Prajzler, Vít zslav Je ábek Václav Prajzler Václav Prajzler (Gar.) Diagnostics and Reconfiguration of Programmable Circuits	ZK	4	2P+2S	Z	S
XP15DVN		Z,ZK	4	2P+2S		s s
	Diagnostics of HV and EHV Insulating Systems Electric Discharges and their Applications		-	-		-
XP02DP	Pavel Kubeš, Karel ezá Karel ezá Pavel Kubeš (Gar.)	ZK	4	2P+2C	L	S
XP32DZS	Digital Signal Procesing in Telecommunications	ZK	4	4P + 0S	L	S
XP33DID	Distributed Artificial Intelligence	ZK	4	2P+1S	Z	S
XP36DSY	Distributed Systems	ZK	4	2P	Z	S
XP37DRS	Satellite communication and navigation systems František Vejražka	Z,ZK	4	2+2s	Z	S
XP14DES	Dynamics of Electric Machines Miroslav Chomát Miroslav Chomát Miroslav Chomát (Gar.)	ZK	4	2P+2C	Z	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
XP37ELA	Elastoacoustics	ZK	4	2+0s	L	S
XP15ES	Electrical Lighting	Z,ZK	4	2P+2S	L	S
XP15ET	Electroheat Jan Kynci Jan Kynci Jan Kynci (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 Jan Voves (Gar.)	ZK	4	2P+2C	Z	S
XP17ELD	Electrodynamics	ZK	4	2P+2C	Z	S
XP14EMC	Electromagnetic Compatibility Zden k e ovský Zden k e ovský Zden k e ovský (Gar.)	ZK	4	2P+2C	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 Ivo Doležel	Z,ZK	4	2P+2S	L	S
XP33ECD	Evolutionary Computing	ZK	4	2P+1S	Z	S
XP15EXE	Expert Systems in Electrical Power Engineering	Z,ZK	4	2P+2S	Z,L	S
XP16FVT	Philosophical Problems of Science and Technology	ZK	2	0P+4S	L,Z	S
XP16FIM	Financial Management	ZK	4	2P+2S	Z	S
XP31FSK	Phonetic signals and their coding	ZK	4	2P+2S	L	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	ZK	4	2P+2S	L	s
XEP33FLO	Jan Hamhalter Jan Hamhalter Jan Hamhalter (Gar.) Fuzzy Logic	ZK	4	2P+0S	L	S
XP33FLO	Mirko Navara Mirko Navara Mirko Navara (Gar.) Fuzzy Logic	ZK	4	2P+0S	L	S
XP35FMD	Mirko Navara Fuzzy Modelling and Control	ZK	4	2P+2C	L	s
XP37FZS	Fuzzy Signal Processing	Z,ZK	4	2+2s	 	s
XP13FDD	Physic of Dielectrics	Z,ZK	4	2P+2S	Z	-
APISEDD	Pavel Mach Pavel Mach Pavel Mach (Gar.)	Ζ,ΖΝ	4	2P+25	Ζ	S
XP02FPL	Solid State Physics Antonio Cammarata Antonio Cammarata Antonio Cammarata (Gar.)	ZK	4	2P+2C	L	S
XP13FPD	Semiconductor Physics Vít zslav Benda Vít zslav Benda (Gar.)	Z,ZK	4	2P+2S	Z	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
XP37GAB	Genesis and Analysis of Biosignals	ZK	4	3P+1S	L	S
XP33GAD	Geometrical Algebras	ZK	4	2+0s	L	S
XP02HS	Noise Surveys Ond ej Ji í ek	ZK	4	1P	L	S
XP36HS	Hypermedia Systems and Internet Computing Ivan Jelínek Ivan Jelínek Ivan Jelínek (Gar.)	ZK	4	2P+2S	L	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	ZK	4	2P+2C	Z	S
XP12IMM	Je ábek (Gar.) Engineering Methods in Mechanics	Z,ZK	4	2+2s	L	S
XP36JAI	Languages for Artificial Intelligence Josef Kolá	ZK	4	2P+2S	Z	s
XP01KAS	Complexity and Combinatorical Algorithms	ZK	4	2+1	L	S
XP36KP	Communication Protocols	ZK	4	2P	L	S
XP34CNO	Integrated Optics           Vít zslav Je ábek, Ji í tyroký Ji í tyroký Ji í tyroký (Gar.)	ZK	4	2P+2C	Z,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 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	ZK	4	2P+2C	L	S
XP35LSD	Linear Systems	ZK	4	2P+2C	L	S
XP36LSM	Logical Simulation	ZK	4	2P+2S	Z	S
XP33LPD	Logic and Logic Programming	ZK	4	2P+2S	L	S
XP38MPX	Magnetism in Engineering Practice Pavel Ripka Pavel Ripka Pavel Ripka (Gar.)	ZK	4	2P+2C	Z	s
XP02MHD	Magnetohydrodynamics Pavel Kubeš Pavel Kubeš (Gar.)	ZK	4	2P	Z	S
XP16MAN	Management	ZK	4	2P+2S	L	S
XP16MAV	Production Management	ZK	4	2P+2S	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
XP01MST	Mathematical Statistics	ZK	4	2+1	L	S
XP01MTS	Mathematical Methods in Signal Theory	ZK	4	2+1	Z	S
XP01MKR	Mathematics for cryptography	ZK	4	2+1	Z	S
XP33MKD	Mathematics for Cybernetics - Selected Topics	ZK	4	2P+2S	L	S
XP01MTP	Matrix Calculus	ZK	4	2P+1S	L	S
XP15MPE	Mechatronics in Electrical Power Engineering	Z,ZK	4	2P+2S	L	S
XP38MMN	Measurement of Nonelectric Quantities	ZK	4	2P+2L	L	S

XP15MVN	High Voltage Measurement	Z,ZK	4	2P+2S	L	S
XP17MVP	Methodology of Science Stanislav Vítek Stanislav Vítek (Gar.)	ZK		2P+2C	Z	s
XP37MVP	Stanislav Vitek Stanislav Vitek (Gar.) Scientific Work Methodology Stanislav Vitek Miloš Klíma	ZK	4	4P+0S	Z	S
XP17MAPP	Analysis Methods for Passive Elements of Microwave and Millimeter-wave Technique Jan Machá, Vít zslav Pankrác Jan Machá 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
XP14MIR	Microprocessor Control of Electric Drives	ZK	3	4+0s	Z,L	s
XP34MSY	Microsystems Miroslav Husák Miroslav Husák Miroslav Husák (Gar.)	ZK	4	2P+2C	Z,L	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 Pavel Mach (Gar.)	Z,ZK	4	2P+2C	Z	S
XP33ICT	Modern ICT for Industry and Smart Grids	ZK	4	2P+0S	L	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 Ji í Lettl (Gar.)	ZK	4	2P+2C	Z	S
XP37MPS	Multimedia Signals Transmission Václav Žalud Václav Žalud	ZK	4	2P+2S	Z	S
XP31NOS	Design and circuit structures of electronic systems Ji í Hospodka 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 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
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
XP04N2	German language 2	NIC		4C	Z,L	S
XP04N2ZK	German language 2	ZK	0		Z,L	S
XP36NSN	Neural Networks and Neurocomputers	ZK	4	2P+2S	Z	S
XEP33NEP	Neuroprosthetics	Z,ZK	4	2P+0S	Z	S
XP14MEN	<b>New Trends in Converter Technology</b> Zden k e ovský, Ji í Lettl <b>Ji í Lettl</b> Ji í Lettl (Gar.)	ZK	4	2P+2C	L,Z	S
XP14APR	New Trends in Electric Device Apply	ZK	3	4+0s	L	S
XP14TPR	New Trends in Electric Device Theory	ZK	3	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
XP35OFD	Estimation and Filtering	ZK	4	2P+2C	Z	S
XP37ODS	Optical Design and Simulation	ZK	4	2P+2C		S
XP17OV	<b>Optical Fibers</b> Stanislav Zvánovec <b>Stanislav Zvánovec</b> Stanislav Zvánovec (Gar.)	ZK	4	2P+2C	L	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	Z,ZK	4	2P+2S	Z	S
XP02PT	Ivan Kudlá ek Ivan Kudlá ek Ivan Kudlá ek (Gar.) Plasma Technologies	ZK	4	2P	L	s
XEP36AGT	Advanced Computational Game Theory Branislav Bošanský, Viliam Lisý Branislav Bošanský Branislav Bošanský (Gar.)	ZK	4	2P+0C+4D		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
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
XEP33SAM	Understanding State of the Art Methods, Algorithms, and Implementations	ZK	4	2P+2S	L	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
XP37PKP	Biomedical Engineering in Clinical Practice	ZK	4	2P+0S	L	s
XP36PAS	Algebraic Specifications Prototyping Karel Richta Karel Richta Karel Richta (Gar.)	ZK	4	2P+2S	Z,L	s
XP33PAM	Industrial application of multi-agent systems	ZK	4	1P+0S	L	S
XP13PSD	Flexible Production Systems	Z,ZK	4	2P+2S	Z	S
XP15PEE	Transmission of Electricity Zden k Müller Zden k Müller	Z,ZK	4	2P+2S	L	s
XP38PSL	Aircraft Instrumentation Jan Rohá Jan Rohá Jan Rohá (Gar.)	ZK	4	2P+2L	Z	s
XP38PUC		ZK	2		L	S
XP37RAD	Radioelectronics Pavel Ková Pavel Ková Pavel Ková (Gar.)	ZK	4	2P+2S	L	s
XP36RSY	Reconfigurable Systems	ZK	4	2P+2S	L	S
XP35RRD	Robust Control	ZK	4	2P+2C	Z	S
XP33RSK	Robust Statistics for Cybernetics Jana Nosková Jana Nosková Jana Nosková (Gar.)	ZK	4	2P+0S	L	s
XP33ROD	Pattern Recognition	ZK	4	2P+2S	L	S
XP04R1ZK	Russian language 1	ZK	0		L,Z	S
XP04R1	Russian language 1	NIC		4C	Z,L	S
XP04R2	Russian Language 2	NIC		4C	Z,L	S
XP04R2ZK	Russian language 2	ZK	0		Z,L	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	ZK	4	2P+2C		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
XP15SPS	Coupled Problems in Heavy Current and Power Engineering Ivo Doležel	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
XP39SPG	Computer Graphics Seminar Ji í Bittner, Daniel Sýkora Daniel Sýkora Ji í Bittner (Gar.)	Z,ZK	4	2P+2S	L	s
XP36SEP	Seminars on Architectures of Parallel Computers	ZK	4	2P	L	S
XP38SSB	Sensors and Buses Antonín Platil Antonín Platil (Gar.)	ZK	4	2P+2L	Z,L	s
XP13SID	Software in Industrial Engineering Martin Molhanec Martin Molhanec Martin Molhanec (Gar.)	Z,ZK	4	2P+2C	Z	S
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
XP02SF	Statistical Physics Petr Kulhánek, Antonín Krpenský Antonín Krpenský Petr Kulhánek (Gar.)	Z,ZK	4	3P+1S	L	s
	Statistical Signal Processing			1		

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 Vojt ch Franc (Gar.)	ZK	4	2P+1S	L	S
XP34STV	VLSI Structures and Technologies Ji í Jakovenko 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
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 Pavel Mach, Karel Dušek Karel Dušek Karel Dušek (Gar.)	Z,ZK	4	2P+2L	L	S
XP34TOS	Technology of Optical Devices Václav Prajzler, Vít zslav Je ábek Václav Prajzler Václav Prajzler (Gar.)	ZK	4	2P+2C	Z,L	S
XP37TEA	Theoretical Eletroacoustics Libor Husník, Zden k Škvor Libor Husník Libor Husník (Gar.)	Z,ZK	4	3P+1S	Z	S
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 Antonín Krpenský (Gar.)	Z,ZK	4	3P+1C	L	S
XP37TAS	Acoustic signal processing and theory František Rund, Václav Vencovský, 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	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 <b>Ond ej Ji í ek</b> Ond ej Ji í ek (Gar.)	ZK	4	2P	Z	S
XP17TAM	Evaluation of Applicators for Microwave Thermotherapy Jan Vrba 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 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
XP02UFL	Introduction to Laser Physics Jan Pichal Jan Pichal Jan Pichal (Gar.)	ZK	4	2P	L	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	Z,ZK	4	2P+2S	Z,L	S
XP13VTK	Vacuum technology and cryogenics	Z,ZK	4	2P+2S	Z	S
XP37VRA	Research Seminars in Radioelectronics and Acoustics Jan Sýkora	Z,ZK	4	1P+1S	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	ZK	2	0P+4S	L	s

	Selected Parts from Photonics	71/	4	4P+0S		
XP37VKF	Miloš Klíma Miloš Klíma Miloš Klíma (Gar.)	ZK	4	4P+05	L	S
XP38VKP	Selected Parts of Instrumentation Jan Holub Jan Holub Jan Holub (Gar.)	ZK	4	2P+2L	Z,L	S
XP01TEM	Selected chapters of the measure theory	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 <i>Ji í Kléma</i>	ZK	4	2P+2S		S
XP01VPS	Selected topics in probability and mathematical statistics Kate ina Helisová 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 <b>Petr Koní ek</b> 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 Šerzod Tašpulatov Šerzod Tašpulatov (Gar.)	ZK	4	2P+2S	L,Z	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
XP15VME	Research Methods in th Use of Electrical Energy Jan Kyncl, Ivo Doležel 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
XP33ZPM		ZK	4	1P+1S	L	S
XP33ZVD	Introduction to Computer Vision	ZK	4	2P+2S	Z	S
XP01ZWT	Wavetet Transform. Jan Hamhalter	ZK	4	2P+1S	L	S
XP37ZI	Information recording František Kadlec	Z,ZK	4	2P+2S	L	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 František Vejražka (Gar.)	Z,ZK	4	1P+3S	Z	S
XP37ZSN2	Signal processing in satellite navigation systems 2 František Vejražka 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
Characteristics of the	courses of this group of Study Plan: Code=XPKKPPP Name=I	Doctoral sub	iects XP	kkppp		
	tive Methods in Acoustics		-		ZK	4
	nce, Huygens principle, sound field in ducts, vawe-guides and enclosures. Active noise				-	
-	ing, modes, local control. Feedback and feedforward strategy, analog adn digital realisa ions of active systems. Active control of vibrations, transducers for active control.	aons, aiguillinns i	Jaseu Uli L	wo, stadility (	n aiguninnis,	munuchannel
-	oustic and Electroacoustic Measurements			Z	,ZK	4
	essure, measuring microphones. Measurement of acoustic impedance. Foundamental					
•	n of measuring microphones. Method of reciprocity. Method of reciprocity in the field of ors of velocity and displacement. Measurement of mechanical impedance, impedance					
	nents. Measurement of thin membranes and air-gaps. Acoustic intensity measurement					
I	oustics and Electroacoustics of Solid State				,ZK	4
	nbounded continuum. Wave equation. Scalar and vector potential. Plane harmonic unit				-	
-	ace, reflection and refraction of a plane wave at an interface between too solids. P-wave cylindrical wave-guide. Solid-state waveguides of non-uniform cross-section. Piezoelec			-		-
of volume and surface waves						

Vocal tract, anatomy, physiology. Vocal cords, production of speech. Types of phonems. Speech analysis and synthesis. Automatic recognition of speech.

ΖK

4

XP37AR

Speech Acoustics

	ZK	4					
Information about the basic principles and possibility of the application of the neural informative technology for the signal processing are the m							
the introduction into the artificial neural networks (ANN) theory and applications, to the choice and the optimisation of the structures and the neural network applications at the signal processing are investigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the KSOM are described.							
XP31AEO       Electric Circuit Analysis       ZK       4							
Circuit models of devices and structures. Methods of analysis and algorithms for linearized circuit models in time domain and frequency domai	I I	•					
state analysis. Analysis of nonlinear circuits in time and frequency domains. Parametric models. Circuits with non-linear energy storing elemen		-					
professional software packages.							
XP04A2SZK English Language	ZK	0					
XP04AZK English Language	ZK	0					
http://www.fel.cvut.cz/anketa/aktualni/courses/XP04AZK							
XP04MIN English Language 2	ZK	0					
English exam in form of defense of professional study in English. The task of the doctoral student before the committee to defend his professional As part of the subsequent discussion. PhD student is evaluated in presentation skills, mastery of the language in continuous speech and langu		-					
during the debate . Account is also the linguistic correctness of written text.	lage skills quickly and c	orrectly respond					
XP04A1ZK English language 1	ZK	0					
The subject A1 ZK is only for those postgraduate students studying in older study program valid up to Sept.2003 and did not ask for studying is	I I	the newer study					
program .							
XP04A1 English language 1	NIC						
The course revises general English from previous studies, further develops speaking skills, listening and recalling spoken English as well as no	te-taking skills. Provide	s basic scientific					
terminology (cause-effect relationship, definitions, classification, basic information on composing written documents ).	714						
XP04A2ZK   English language 2	ZK	0					
Subject is only for those postgraduate students who study in older program valid up to Sept.2003 and did not ask for studying the new language XP04A2 English language 2	NIC						
XP04A2 English language 2 The art of composing written documents (papers, reports, articles, dissertations, official letters ); oral presentations, reading skills (getting both		formation): the					
art of understanding speech in a foreign language ; selected parts of difficult grammar; selected items focused on practical skills (reading math	-						
writing CV). Oral presentations.	,	1					
XP34AT TCAD Tools Applications	ZK	4					
Fundamentals of the computer-aided technological design. Device simulators Atlas and Sentaurus: principle, applications. Basic equations. Bo	undary conditions. Num	erical methods.					
Recombination models. Avalanche ionisation models. Mobility models. Hands-on exercises on SUN workstations according to the tasks of stud							
XP32AKR Applied Cryptography	ZK	4					
Introduction to Cryptography.Mathematics Foundations of Cryptography.Related Problems of Number Theory.Public Key Parameters. Pseudora							
Ciphers. Block Ciphers.Public Key Enciphering. Hash Functions and Data Integrity. Entity Identification and Autentication.Digital Signatures. Key M Techniques.Effective Implementations of Supporting Algorithms. Patent Pendings and Standards.	ianagement Protocols.N	ey Management					
XP17APL Applied Optoelectronics in Medicine	ZK	4					
Scope and aims of non-invasive measurement techniques in medical diagnostics. Fundamental physiology of the vascular system, hemodynar	1 1	perfusion.					
Computer simulation of the cardiovascular system. UV, VIS and IR spectroscopy. Fundamental optics of the eye and color analysis. Optical par	ameters of biological tis	sue. Dispersion					
of light, Design of optical sensors, Optical visualisation principles of translumiscetion and tomography, Optoelectronic systems in medicine.							
		-					
XP36ASP Architecture of Symbolic Computers	ZK	4					
Symbolic expressions and abstract programs, lambda calculus, formal basis for abstract programming, self-interpretation, SECD abstract machine	e, memory management	, demand-driven					
Symbolic expressions and abstract programs, lambda calculus, formal basis for abstract programming, self-interpretation, SECD abstract machine evaluation, Lisp implementations, predicate logic and its inference engine, Prolog inference engine and dynamic algebras, Warren abstract machine evaluation.	e, memory management	, demand-driven					
Symbolic expressions and abstract programs, lambda calculus, formal basis for abstract programming, self-interpretation, SECD abstract machine evaluation, Lisp implementations, predicate logic and its inference engine, Prolog inference engine and dynamic algebras, Warren abstract machine parallel inference engines.	e, memory management ne, optimisation, Prolog in	, demand-driven					
Symbolic expressions and abstract programs, lambda calculus, formal basis for abstract programming, self-interpretation, SECD abstract machine evaluation, Lisp implementations, predicate logic and its inference engine, Prolog inference engine and dynamic algebras, Warren abstract machine evaluation.	e, memory management le, optimisation, Prolog in ZK	, demand-driven mplementations, 4					
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XP36RGM Reading group in data mining and machine learning	ZK	4
Data mining (DM) aims at revealing non-trivial, hidden and ultimately applicable knowledge in large data. Data size and data heterogeneity make	, ,	
to be solved. The main goal is to understand the patterns that drive the processes generating the data. Machine learning (ML) focuses at compute automatically through experience and by the use of data. It often puts emphasis on performance that the algorithms reach. The distinction between	-	
learning is often used as a means of conducting useful data mining. For this reason, we cover both the areas in the same course. The main goal o		
advanced and modern topics in the field.		
XP13DFD Data and Functional Analysis of Production Systems	Z,ZK	4
Technological system of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information		-
Methodology of analysis of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of analysis of user interface of enterprise IS. Object oriented methodology of analysis of enterprise. Methods of time analysis of enterprise is of enterprise.		
enterprise. Documentation and standards for data and functional analysis. Automation of analysis methods, CASE tools.	se. Use of Felli fiels	IOI analysis of
XP34ORD Optical Radiation Detection and Detectors	ZK	4
Spectrum of electromagnetic radiation, radiometric and photometric units. Detection of optical radiation. Ideal detectors, internal and external photo-e	1 1	
photomultipliers. Internal photo-effect detectors, PN junction. PIN photodiode, physical principles, properties. Avalanche photodiode, physical principles, properties.		
physical principles, properties. Thermal energy conversion detectors. Bolometers, thermocouples. Pyroelectric detectors. Some other detector types	. Optical receivers, d	esign principles,
properties, noise. Solar cells, properties. Measurement methods, applications.	ZK	4
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	1 1	
XP15DVN Diagnostics of HV and EHV Insulating Systems	Z,ZK	4
Failure rate of operation, fault sources and mechanisms. Indoor and outdoor insulation of electrical equipment. Diagnostic methods, using in operat	1 1	ds 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	o diagnostics.
XP02DP Electric Discharges and their Applications	ZK	4
Classification of electric discharges. Townsend?s theory. Glow discharge. Processes on the surface of electrodes. Technological applications. Plas		
microwave discharge. Arc. Corona. Spark discharge. Lightning. Ball lightning. Z-pinch and its properties. Electromagnetic collapse. X-ray sources, magnetic fields of Earth.	controlled fusion. Ge	eneration of
XP32DZS Digital Signal Processing in Telecommunications	ZK	4
XP33DID Distributed Artificial Intelligence	ZK	4
In winter semester 2023/24 the course runs for the last time. In future years, it will not be opened anymore. Distributed problem solving. Multiagent	1 1	
Communication. Communication strategies, message passing. Various AI approaches, case studies. Types of agent behavior. Negotiation. Organi		
planning. Blackboard systems. Client-server systems. Peer-to-peer systems. Implementation aspects of distributed knowledge-based systems. Le		systems.
Meta-agent. Agents acquitance models, social knowledge, reflectivity in MAS. Coalition formation, team work. Formal models of agent architectur		
XP36DSY Distributed Systems Communication mechanisms - message exchange, procedural communication (RPC, ORB), distributed shared memory. Process algebras - CSP,	ZK ZK	4
automata, Petri nets. Distributed execution, global state, causality, logical time. Algorithms of: exclusive access, leader election, deadlock detectio	-	
resiliency, qourum algorithms, replication. Mobility, search in distributed systems - DHT.		,
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. Orbit		
parameters of satellite communication channel. Energetic budget of satellite link. Satellite link design. Frequency bands. Modulations and multiplexe		
spectrum communication. Systems VSAT, DAMA, DVB-S, S-UMTS. Multimedia satellite services. Satellite navigation systems: GPS, GLONASS ar and navigation systems integration - CNS systems.	d GALILEO. Satellite	communication
XP14DES Dynamics of Electric Machines	ZK	4
Electric machines play an important role in a number of areas, such as e-mobility, renewable energy sources utilization, robotics and automation.		
to provide the students with deep understanding of the principles, operation, and analysis of rotating electric machinery. Mathematical models based	sed on the theory of	space phasors
or FEM will be developed for various types of electric machines (induction machines, electrically excited synchronous machines, permanent magnetic electric machines) and the second synchronous machines are second as the second synchronous machines are	-	
understanding of electrical machine theory on such a level is necessary, for instance, for design of modern control methods of electric drives or co		
XP16ERU Accounting Principles of accounting. International accounting standards (IFRS). Methodology of accounting. Cost, revenues, profit and cash flow. Balance she	ZK	4 Scoupt Applycic
of company's financial position.		Count. Analysis
XP16EKO Economics	ZK	4
Basic economic terms. Principles of microeconomics, consumer behaviour and producer behaviour. Profit maximization. Perfectly competitive ma	1 1	
Principles of macroeconomics, aggregate demand and aggregate supply. Labour market. Money market and capital market. Macroeconomic police		as a factor
protecting and correcting the market. Comment: The subject is a necessary precondition for understanding other economic and managerial discip		
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. Marg Power elements optimization, subsystem and system optimization in generation and transportation of different kinds of energy. Reliability in energy		
in power industry. Energy price regulation and its consequences	y denvery. Internation	
XP16EME Economics and Management of Energetics	ZK	4
Organizational structure of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and ta	riffs of energy. Gover	mmental energy
policy. Development of international cooperation in power industry and its economic and ecology aspects.		
XP16MEU Economics and Management of Energetics	ZK	4
Organizational structure of electric power sector, heating and gas sector. Principles of integrated source planning. Revenues, costs, prices and ta policy. Development of international cooperation in power industry and its economic and ecology aspects.	ins of energy. Gover	mnental energy
XP37ELA Elastoacoustics	ZK	4
The course deals with interactions of elastic structures with gaseous medium, namely vibrations of plates, radiation impedances, modal equations	1 1	-
acoustic space, finite element method, calculation of eigenfrequencies.		
XP15ES Electrical Lighting	Z,ZK	4
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.	7 71/	
XP15ET   Electroheat The definition of fundamental equations of heat and mass transfer in electromagnetic field in continuum. Thermal effects of electromagnetic field.	Z,ZK	4 problems of
induction, dielectric and arc heating. Similarity and analogy of equations and their use. Numerical methods in electroheat.		

	Physics for Electroenergetics	ZK	4				
Lessons contain selecte	d parts of physics for students of electric power engineering: Physical principles of gas discharges - glow, arc, spark and corona	discharges and th	neir applications.				
	equainted with characteristics for magnetized, astrophysical and fusion energy generation. A part of the course is two excursio	ons in laboratories	CTU and Czech				
Academy of Sciences.							
XP34ETS	Electrical Transport in Semiconductors	ZK	4				
	ort in semiconductor crystals. Effective mass, mobility Boltzmann's transport equation. Scatter mechanisms, frequency. Scatter						
-	xation time approximation Carrier transport in a strong electric field, velocity saturation. Carrier transport in magnetic field. C	-					
	nsport, density matrix, Green's and Wigner's functions. Resonance tunnelling, transport of electrons in superlattices. Single e	electron transport,	Coulomb's				
	bort. Quantum Hall's effect. Simulation of transport effects.	71/	4				
XP17ELD	Electrodynamics	ZK	4				
XP14EMC	Electromagnetic Compatibility	ZK	4				
	terference coupling. Shielding. Earthing. Nonlinear consumers. Harmonics in electric convertors in steady and transient cond	litions. Supression	of negative				
	he network. Compensation and filtration.	71/	4				
XP38EMC	Electromagnetic Compatibility of Data Acquisition Systems surement of electromagnetic emission and immission. EMC standards. Modelling of disturbing signals. Electromagnetic distu	ZK	4				
	with regard to EMC. EMC of data transmitting lines.		ny and moustry.				
XP15EH	Energy Economy	Z,ZK	4				
	f national economy. Terminology of energy economy. The energy systems. Forecast of energy consumption. Energy balance in		-				
	nomy and its impact to environment. Energy economy on the organization level. The control of energy economy. Basic proble	-					
XP15EZP	Control in Power Engineering	Z.ZK	4				
-	al problems. The role of power engineering. Global climate change. The greenhouse effect. Carbon dioxide emissions. Impact	I ' I	•				
	enewable energy sources. Methods and technology for decreasing of impact to environment. Electric power transmission and						
power energy system							
XP33ECD	Evolutionary Computing	ZK	4				
	ary computing in contrast to classical computing techniques, Genetic algorithms (GA) for optimisation. The Simple Genetic A	I —·· I					
	ive phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typica						
	Special methods for improving GA performance.		3				
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						
	peering 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 ma	I I	_				
	the so called "Postmodernism" and to the alternative ways of understanding and their social coherences are discussed.						
XP16FIM	Financial Management	ZK	4				
	esent value and alternative cost of capital, net present value, present value of bonds and stocks, investment decision making	I I					
	al, risk and return, lease or buy decision, inflation and return, real options, financial options, option valuation, hedging, short t	-					
XP31FSK	Phonetic signals and their coding	ZK	4				
	he processing of speech signals. Within the subject students should manage from basic to advanced and modern algorithms	s of speech analys	sis synthesis				
			, synthosis, j				
	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	task as small and	arge vocabulary				
-		task as small and	arge vocabulary				
speech recognition or s XP15FAK	beaker recognition. Special attention is devoted to usage of classification techniques based on GMM, DTW, HMM, ANN/DNN	task as small and I N, WFST, JFA, i-ve Z,ZK	arge vocabulary ctrors, etc. 4				
speech recognition or s XP15FAK Principle of photometric	beaker recognition. Special attention is devoted to usage of classification techniques based on GMM, DTW, HMM, ANN/DNN Photometry and Colorimetry	task as small and I N, WFST, JFA, i-ve Z,ZK hetric distance. Me	arge vocabulary ctrors, etc. 4 asurement of				
speech recognition or s XP15FAK Principle of photometric light source parameters	beaker recognition. Special attention is devoted to usage of classification techniques based on GMM, DTW, HMM, ANN/DNN Photometry and Colorimetry methods. Standards of luminance and luminous flux. Receivers of radiation and modification of their characteristics. Photom	task as small and I N, WFST, JFA, i-ve Z,ZK hetric distance. Me	arge vocabulary ctrors, etc. 4 asurement of				
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XP35FMD Fuzzy Modelling and Control	ZK	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	1	-
especially analysis and synthesis of Takagi-Sugeno fuzzy systems, utilization of fuzzy systems and neural networks in control of nonlinear systems		
functions appearing in the description of the system, and design of adaptive fuzzy systems both direct and indirect.	., .,, .	
XP37FZS Fuzzy Signal Processing	Z,ZK	4
PhD students education and their research activities are focused on the problems of utilize fuzzy logic and neural network for optimization algorithm u	1	
as adaptive filtration, diagnostic of the signal, control phase lock and so on.		
XP13FDD Physic of Dielectrics	Z,ZK	4
Types and mechanizmus of polarization. Dielectric absorption. Electrical conductivity of insulators. Dielectrics in static electrical field. Dielectrics in ti	1	-
Frequency dispersion of polymers. Thermal dispersion of polymers. Optical properties of dielectrics. Dielectrics losses. Electrical strength of insulato		
dielectrics films. Ageing of insulators. Properties of feroelectrics. Main and joined phenomena in dielectrics.		
XP02FPL Solid State Physics	ZK	4
The course provides fundamentals of solid state physics at large.		
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 unde	1	
components technology.	retaining of the ot	
XP37FHA Physiological, Psychological and Musical Acoustics	ZK	4
Anatomy of the hearing organ, hearing theory, hearing field, loudness, masking, pitch of sound, temporal tresholds, distortion in the hearing organ, a	1	
of hearing system. Binaural hearing, objective and subjective properties of musical signals, statistical and dynamical analysis. Perception of simple i		
consonancy and dissonancy. Psychoacoustics of transmission of the musical signal. Methods of psychoacoustic measurements, their validity, repea	-	
of listening tests, methods of statistical analysis of results, interpretation.	i abiii g c	
XP37FHA1 Physiological, Pychologycal and Musical Acoustics 1	ZK	4
Properties of musical signal in temporal and frequency domains, methods of sound synthesis, timbre and interpretation of sound spectra, objective	1	
sound quality, introduction to acoustics of speech and singing, physicalacoustic principles of musical instruments, tuning, dynamics, timbre of the to		
instruments, introduction to account of speech and singing, physical account principles of musical instruments, turning, dynamics, timbre of the to instruments, introduction to methodology of measurement of musical instruments.	ne, radiation prop	
	71/	4
XP37GAB Genesis and Analysis of Biosignals	ZK	4
The subject deals with genesis and description of the most important biological signals of both electric and non-electric nature. Properties of the biosig		ne consequentiai
signal processing, are studied. Finally, simple and advanced methods of biosignals pre-processing, analysis and evaluation are presented for each	-	
XP33GAD Geometrical Algebras	ZK	4
Algebraic structures used in geometry: Groups and linear spaces, ordered groups and fields, othogonal groups, Clifford algebras, etc. Discussion of	potentital applica	tions in image
processing.		
XP02HS Noise Surveys	ZK	4
Sound field, noise and vibration measurement, noise legislation, hygiene control. Types of noise surveys, examples, types of noise sources. Noise noise sources.	napping, principles	s and types of
sources. Noise in working environment. Noise in buildings. Transport noise, airport noise. Technical principles of noise control.		
XP36HS Hypermedia Systems and Internet Computing	ZK	4
Hypermedia systems, basic models. Intelligent searching, adaptive navigation, personalization of access to web applications. Web intelligence, sem	antic web. Web er	ngineering, main
topics and the ways out. Internet computing. Modern technologies for web applications design.		
XP33IMD Informatics in Clinical Medicine	ZK	4
Medical data processed by automatized systems. Specific problems of medical informatics. Computer supported documentation in doctor's work. H	ospital information	n systems.
Requirements on information system projects from the point of view of medicine. Introduced hospital information systems. Diagnosis theory, computer a	aided diagnosis. K	nowledge-based
systems and their application in medicine. Database systems, biomedical databases. Computers in clinical biochemical laboratories. Computers in r	netabolic and inte	nsive care.
Computer aided therapy planning. Standardiyation and communication between information systems in medicine. Specialized computer networks.		
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 differe	ntial equations. In	troduction to
distribution theory, Fourier and Laplace transforms of distributions. Linear dynamic systems, causality, passivity, convolution. Systems with bounded sp	ectrum. Z-transfor	m and difference
equations.		
XP34IO Integrated Optics	ZK	4
Light propagation in waveguide structures. Methods of waveguide structure design. Waveguide coupling elements. Gratings structures at waveguide	∍s. Fundamental p	hysical effects
and interactions for IO. Design and preparation of dielectric and polymer waveguides and structures. Optical waveguide gratings. Passive waveguide	e structures. Elect	ro-absorption,
electro-optical and thermo-optical effects and their use for IO. Structures for control of optical radiation Devices based on nonlinear effects. Semica	onductor integrate	d structures,
optical amplifiers. Optical components for informatics and sensors, multiplexing and optical processing. Applicable measurement methods, principle	s of nanophotonic	s and integrated
optics application.		
XP12IMM Engineering Methods in Mechanics	Z,ZK	4
Review methods solution of problems in rigid bodies mechanics, hydromechanical, thermodynamic and electromechanical systems. Dynamics of corr	1	th using methods
of vectorial and analytical mechanics, assembling of mathematical model and resources for simulation. Identification of system parameters with resp	pect to passive res	sistances and
energy losses. Physical similarity and analogy, dimensional analysis, dimensionless parameters, PI-terms, fundamentals of experimental research		
XP36JAI Languages for Artificial Intelligence	ZK	4
The course offers a deep insight into the two programming languages that are most frequently used in the domain of artificial intelligence (Lisp, Pro	1	
paradigms used to build typical AI algorithms and gives some basics concerning the implementation of the two languages.	0, 1	
XP01KAS Complexity and Combinatorical Algorithms	ZK	4
Time and space complexity of algorithms. P and NP problems and their solutions: exact solutions, heuristics, approximation schemes, probabilistic alg	1	
XP36KP Communication Protocols	ZK	4
Communication protocol principles, SDL language, protocol architecture: ISO OSI, error control, data-link layer protocols: X.25, higher layer protocol	1	municating finite
state machines, implementation tools (FSM language ESTELLE, regular grammars), use of Petri nets, specification language LOTOS, protocol tran		-
validation and verification of protocols.	, uooigi	., _ ,
XP34CNO Integrated Optics	ZK	4
Theoretical and technological principles of IO Basic materials for IO. Light propagation in waveguide structures. Methods of waveguide structure design	1	1
elements. Graticule structures. Modal spectroscopy. Fundamental physical effects and interactions for IO. Preparation of dielectric waveguides and s		
structures. Electro-optical modulators. Applicable measurement methods. Devices based on nonlinear effects. Semiconductor integrated opto-electr		, naveguide
		A
XP16KVM Quantitative Research Methods in Management	ZK	4
Application of software SPSS for advanced statistical methods as multiple regression and correlation, analysis of variance, factor analysis, cluster a	inalysis and its USI	ng in marketing
research and management.		

XP01KVP	Quantum Computing	ZK	4
	presents a new programming paradigm. The safety of nowadays encypering techniques is based on enormous computation or		
1	hay be broken by quantum computers. The ``building stones" of a quantum computer and quantum computers will be develop In algorithms, fast database search, etc.	ed during the cou	rse. we will
XP17LAE	Medical Applications of Electromagnetic Field	ZK	4
	Medical applications of Electromagnetic Field	1	-
	nicrowave thermotherapy apparatus are given, especially from the point of view of applicators for local, intracavitary and regi		
	rasound and radiometry) and special compatible applicators are described.		
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	1	
	bol in systems control and signal processing. Theory: Convex sets represented via LMIs; LMI relaxations for solution of non-c		
	algorithms to solve LMI problems; Solvers and software; LMIs for polynomial mehods in control. Control applications: robustne		
1. · · ·	d-order robust controllers with H-infinity specifications. For more information, see http://www.laas.fr/~henrion/courses/lmi		
XP35LSD	Linear Systems	ZK	4
	the master program lectures on Dynamical Systems Theory. The structure and properties of linear multi-input multi-output systems		1 -
	design of linear controls is demonstrated. The presentation focuses on pole placement techniques, linear state regulation and		-
design. State-space and	d transfer-function design techniques are compared. The lectures are supported by laboratory experiments using Matlab, Contr	ol System Toolbox	, and Polynomial
Toolbox.			
XP36LSM	Logical Simulation	ZK	4
General introduction to	simulation: fundamental ideas and principles of simulation systems, synchronous and asynchronous simulation. Simulation syst	em VHDL and its u	use for simulation
of digital circuits: data t	ypes, entities, architectures, sequential environment (processes, functions, procedures), signals and their attributes, resolution	on function, paralle	el environment
(data-flow description, I	blocks, structural description), configuration of structural models. Students who completed course 36SIM cannot enroll.		
XP33LPD	Logic and Logic Programming	ZK	4
Mathematical logics an	d its relation to technical disciplines. Formal system and its essential properties - validity, completeness. Syntax and semanti	cs, basic definition	is. Compactness
theorem. First order lan	guage and its interpretation. Theory and its model, Herbrand's model. Herbrand's theorem, Gödel's completeness theorem	and their practical	implications.
Limits of computability a	and probability. Logic programming and Prolog language. Metodology of logic programming. Introduction of extralogical feature	s and metapredic	ates. New trends
- constraint logic progra	amming (CLP)and inductive logic programming (ILP). Some practical examples of complex logic programs and practical appli	cations.	
XP38MPX	Magnetism in Engineering Practice	ZK	4
Students will be introdu	ced into the magnetic materials, magnetic sensors and engineering magnetism including FEM design and magnetic measure	ements and testing	g. The content of
this advanced course c	an be modified according to the students' needs.		
XP02MHD	Magnetohydrodynamics	ZK	4
Qualitative description	of the behaviour of hot plasma in magnetic fields		
XP16MAN	Management	ZK	4
Principles of managem	ent and its innovation, modern ways of management, responsibility of managers, manager's ethics, successful manager thin	king and behaviou	ır.
XP16MAV	Production Management	ZK	4
The role of production p	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.
Standardized basis of p	production management, standardization. Controlling, production management methods.		
XP16MAU	Accounting for management	ZK	4
The principles of manage	gerial accounting. Relations to the organisational structure of the enterprise and to the production process. Budgets, use for m	anagement. Calci	ulations and cost
analyses. Productivity a	and measurement of productivity in the production process. The managerial information systems.		
XP16MAR	Marketing	ZK	4
The role and functions of	of the marketing management. Marketing research and marketing information system. Concepts of marketing strategy. The us	e of product life cy	cle and portfolio.
Product and service po	licy, pricing and contractation policy, communication, distribution. Marketing mix.		
XP16MAS	Marketing Strategies	ZK	4
Broadening of basic kn	owledge of marketing. The analysis of marketing strategies in different market situations. The firm's behavior under competiti	on and competitiv	e advantage.
Case studies in the field	d of product policy, price and condition policy, communication policy and distribution policy.		
XP01MST	Mathematical Statistics	ZK	4
Random sampling, orde	ered sampling and their distributions. Sample statistics. Point estimates and interval estimates. Confidence intervals. Estimation	ons, unbiased and	consistent
estimates. Hypothesis t	esting for distribution parameters. Hypothesis testing for equality of parameters. Nonparametric tests. Regression analysis.		
XP01MTS	Mathematical Methods in Signal Theory	ZK	4
Continuous, discrete, p	eriodic and almost periodic signals. Fourier series and Fourier integral. Band-limited signals. Theorems of Paley-Wiener and	Shannon-Kotelnik	ov. Modulation.
Analytic signals.			
XP01MKR	Mathematics for cryptography	ZK	4
Introduction to the theo	ry of groups, finite fields, and polynomials over finite fields and their applications in cryptography.		1
XP33MKD	Mathematics for Cybernetics - Selected Topics	ZK	4
	athematics. Ordering, lattices, Boolean algebras, representations. Topological spaces. Metric spaces, completeness, fixed-po		pplications,
fractals. Linear spaces,	constructions with linear spaces. Systems of linear equations, spectral theory. Matrix calculus, matrix inequalities. Least squares	and singular value	e decomposition.
Tensor product. Elemer	ntary theory of Hilbert spaces. Introduction to category theory.		
XP01MTP	Matrix Calculus	ZK	4
Similar matrices. Jordar	n blocks, Jordan canonical matrices. Real canonical form of a real matrix. Characteristic and minimal polynomial. Caley-Hamilt	on thoerem. Funct	ions of matrices,
exponential matrix. Sym	netric, orthogonal and positive matrices. Diagonalization of symetric, positive and circulant matrices. Singular value decomposition	on. Moore-Penros	e pseudoinverse
matrix. Generalized sol	ution of systems of linear equations.		
XP15MPE	Mechatronics in Electrical Power Engineering	Z,ZK	4
Basic model modules, m	hodels and control systems of steam generators, steam and water turbines and nuclear reactor. Dynamics and control of STATCO		compensatores.
XP38MMN	Measurement of Nonelectric Quantities	ZK	4
Physical principles of se	ensors. Measurement of temperature, pressure, flow, movement, position and other physical quantities. Chemical sensors an		ensors, metal
detectors, detection of	explosives. New types of signal conditioning circuits. Sensor Applications in industry, transport and consumer electronics. Se	curity and military	applications.
Sensor design and tech	nnology. Signal processing in sensor systems, intelligent sensors.		

XP15MVN	High Voltage Measurement	Z,ZK	4
	s and high voltage generators. Measurement cables, attenuators. Disturbances of HV measurement. Measurement of impuls	· · ·	age dividers,
types of dividers. Divide	rs for measurement of fast transients, calibration of dividers. Measurement of DC high voltages, HV resistors and dividers. Measurement of DC high voltages, HV resistors and dividers.	easurement of AC	Chigh voltages,
	ment of RMS voltages. Instruments for measurement of voltage peak values. Measurement of high current, shunt reactors, F	Rogowski coil. Me	asurement of
	tilization of optical-fibre waveguides. Voltage tests of transformers. HV measurement of dielectrics.		
XP17MVP	Methodology of Science	ZK	
XP37MVP	Scientific Work Methodology	ZK	4
	of scientific work, exploitation of literature and other information resources, accessible databases, fundamentals of project parate (DhD Thesis article as farmers) and actest as and actest accessible laterast available to a farmers (MMM/ program)	-	-
	nents (PhD Thesis, article, conference), patents and patent search, Internet exploitation, discussion groups, WWW presenta		
XP17MAPP	Analysis Methods for Passive Elements of Microwave and Millimeter-wave Technique solution of microwave circuits scattering parameters, analysis of planar antennas. Survey of bas	ZK	4 alveis of passive
	n methods: spectral domain, integration equation, finite differences, finite elements, mode matching, transversal resonance.		
	noment method, disturbance method.		
XP38MDR	Methods of Signals Digitalization and Reconstruction	ZK	4
The up-to-date and unco	nventional methods of analog preprocessing of typical sensors signals, selection of optimal digitization methods and optimiza	tion of hardware s	olution including
	ement results to achieve high accuracy and effective suppression of disturbing signals.		
XP38MPM	Methods for Precision Measurement of Electrical Quantities and Measurement Data Processing		4
	ectrical quantities. Collective standards. Inductive ratio devices for precision electrical measurements and possibilities of improv		
Modern methods for pre of measurement data.	cision measurement of active and passive electrical quantities. Evaluation of measurement errors and uncertainties. Metrolo	gical reliability. Sta	atistical analysis
XP14MIR	Microprocessor Control of Electric Drives	ZK	3
	I signal processor (DSP), digital signal microcontroller (DSC), architecture, computational resources, fixed point, fraction, floa	I	-
	special blocks, ADC, event memory, FIFO, CAM, Multiport RAM, impulse signal generation, serial communication, methods, I		-
multiprocessor systems	parallel processing, RT systems, solution methods, systems: INT, BG-FG, FSA, CC, preemptive RTOS, tasks, queues, sem	aphors, critical se	ction, control
computer programming	methods, control computer resources application in scalar and vector control of electric drives.		
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	uring technologies	s. Materials.
Industrial applications.		71/	4
XP17MT	Microwave Technique lines and its circuit elements including hybrid and monolithic integrated circuits technology. Resonators and other type of pa		4 alomonte (o a
	olators and circulators, modulators etc.) and active microwave circuits (e.g. oscillators, mixers and amplifiers), microwave filte		
CAD of microwave circu			
XP32MOS	Mobile Networks	ZK	4
The course familiarizes	, students with evolution and standardization of mobile networks and mainly provides a detailed description of network architectu	res and discusses	basic principles
used in mobile networks	. The course as well depicts trends and the future development of mobile networks.		
used in mobile networks	The course as well depicts trends and the future development of mobile networks. Modal Logics for Distributed Systems	ZK	4
used in mobile networks XP33MOL A model of knowledge in	The course as well depicts trends and the future development of mobile networks. Modal Logics for Distributed Systems a distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possib	ZK le-worlds model. I	4
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond	The course as well depicts trends and the future development of mobile networks. Modal Logics for Distributed Systems a distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possib ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agree	ZK le-worlds model. I ment.	4 Properties of
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD	The course as well depicts trends and the future development of mobile networks. Modal Logics for Distributed Systems a distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possib ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreen Modelling and Simulation of Technological Systems	ZK le-worlds model. I ment. Z,ZK	4 Properties of 4
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possib ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agree Modelling and Simulation of Technological Systems ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap	ZK le-worlds model. I ment. Z,ZK bhic edited system	4 Properties of 4 ns and examples
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling	The course as well depicts trends and the future development of mobile networks. Modal Logics for Distributed Systems a distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possib ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreen Modelling and Simulation of Technological Systems	ZK le-worlds model. I ment. Z,ZK bhic edited system	4 Properties of 4 ns and examples
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electror	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreen     Modelling and Simulation of Technological Systems     ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap     of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations.	ZK le-worlds model. I ment. Z,ZK ohic edited system mples of simulatio	4 Properties of 4 ns and examples
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electror XP33ICT	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agree     Modelling and Simulation of Technological Systems     ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap     of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations.     Modern ICT for Industry and Smart Grids	ZK le-worlds model. I ment. Z,ZK ohic edited system mples of simulatio ZK	4 Properties of 4 as and examples ons. Modelling of
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electror XP33ICT XP14MRP	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreen Modelling and Simulation of Technological Systems ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations. Modern ICT for Industry and Smart Grids Advanced Controlled Drives	ZK le-worlds model. I ment. Z,ZK ohic edited system mples of simulatio	4 Properties of 4 ns and examples ons. Modelling of 4
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electror XP33ICT	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreer Modelling and Simulation of Technological Systems ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations. Modern ICT for Industry and Smart Grids Advanced Controlled Drives CNS Modern Systems	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulatio ZK ZK	4 Properties of 4 as and examples ons. Modelling of 4 3
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electron XP33ICT XP14MRP XP37MSC XP34APD	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreen Modelling and Simulation of Technological Systems ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations. Modern ICT for Industry and Smart Grids Advanced Controlled Drives	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulation ZK ZK ZK ZK ZK	4 Properties of 4 as and examples ons. Modelling of 4 3 4 4
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electron XP33ICT XP14MRP XP37MSC XP34APD Physical and technologi	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ance between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreer Modelling and Simulation of Technological Systems ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations. Modern ICT for Industry and Smart Grids Advanced Controlled Drives CNS Modern Systems Advanced Power Semiconductor Devices and ICs	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulation ZK ZK ZK ZK diodes. Schottky of	4 Properties of 4 as and examples ons. Modelling of 4 3 4 4 diodes. Bipolar
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electron XP33ICT XP14MRP XP37MSC XP34APD Physical and technologi	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreer Modelling and Simulation of Technological Systems ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations. Modern ICT for Industry and Smart Grids Advanced Controlled Drives CNS Modern Systems Advanced Power Semiconductor Devices and ICs cal structures. Development trends. Parameters and applications. Bipolar structures. MOS structures. BiMOS structures. High Transistors. Thyristors (including GTO and MCT). Secondary breakdown, mechanism, safe area. Smart-power devices.	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulation ZK ZK ZK ZK diodes. Schottky of voltage ICs, oper	4 Properties of 4 as and examples ons. Modelling of 4 3 4 diodes. Bipolar ation, principles,
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electron XP33ICT XP14MRP XP37MSC XP34APD Physical and technologi transistors. MOS and IG applications XP14MZR	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ance between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreer     Modelling and Simulation of Technological Systems     ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grapp     fectric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations.     Modern ICT for Industry and Smart Grids     Advanced Controlled Drives     CNS Modern Systems     Advanced Power Semiconductor Devices and ICs     cal structures. Development trends. Parameters and applications. Bipolar structures. MOS structures. BiMOS structures. High     New Control Methods for Electric Drives	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulation ZK ZK ZK ZK diodes. Schottky of voltage ICs, oper ZK	4 Properties of 4 as and examples ons. Modelling of 4 3 4 diodes. Bipolar ation, principles, 4
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electron XP33ICT XP14MRP XP37MSC XP34APD Physical and technologi transistors. MOS and IG applications XP14MZR The aim of the course is	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ance between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreer     Modelling and Simulation of Technological Systems     ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap     of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples     Modern ICT for Industry and Smart Grids     Advanced Controlled Drives     CNS Modern Systems     Advanced Power Semiconductor Devices and ICs     cal structures. Development trends. Parameters and applications. Bipolar structures. MOS structures. BiMOS structures. High     New Control Methods for Electric Drives     to introduce students to the latest issues of control and regulation of electric drives, taking into account the focus of their docto	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulation ZK ZK ZK diodes. Schottky of voltage ICs, oper ZK ral work. Its purpor	4 Properties of 4 as and examples ons. Modelling of 4 diodes. Bipolar ation, principles, 4 as is to optimize
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling mechanical and electron XP33ICT XP14MRP XP37MSC XP34APD Physical and technologi transistors. MOS and IG applications XP14MZR The aim of the course is electromechanical energy	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ance between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreer     Modelling and Simulation of Technological Systems     ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grapp     for electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations.     Modern ICT for Industry and Smart Grids     Advanced Controlled Drives     CNS Modern Systems     Advanced Power Semiconductor Devices and ICs     cal structures. Development trends. Parameters and applications. Bipolar structures. MOS structures. BiMOS structures. High     New Control Methods for Electric Drives     to introduce students to the latest issues of control and regulation of electric drives, taking into account the focus of their docto     gy conversion parameters in electric drive systems and relevant power electronics, in particular by using modern control and	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulation ZK ZK ZK diodes. Schottky of voltage ICs, oper ZK ral work. Its purpor	4 Properties of 4 as and examples ons. Modelling of 4 diodes. Bipolar ation, principles, 4 as is to optimize
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electron XP33ICT XP14MRP XP37MSC XP34APD Physical and technologi transistors. MOS and IG applications XP14MZR The aim of the course is electromechanical energy is mainly focused on ele	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreen     Modelling and Simulation of Technological Systems     ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap     fectric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations.     Modern ICT for Industry and Smart Grids     Advanced Controlled Drives     CNS Modern Systems     Advanced Power Semiconductor Devices and ICs     cal structures. Development trends. Parameters and applications. Bipolar structures. MOS structures. BiMOS structures. High     New Control Methods for Electric Drives     to introduce students to the latest issues of control and regulation of electric drives, taking into account the focus of their docto     gy conversion parameters in electric drive systems and relevant power electronics, in particular by using modern control and     ctric AC drives, especially drives with asynchronous and synchronous motors.	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulation ZK ZK ZK diodes. Schottky of voltage ICs, oper ZK ral work. Its purpor regulation algorith	4 Properties of 4 as and examples ons. Modelling of 4 diodes. Bipolar ation, principles, 4 se is to optimize hms. The course
used in mobile networks XP33MOL A model of knowledge ir knowledge. Correspond XP13MSD Program tools of compu - SIMULINK. Modelling of mechanical and electror XP33ICT XP14MRP XP37MSC XP34APD Physical and technologi transistors. MOS and IG applications XP14MZR The aim of the course is electromechanical energy is mainly focused on ele XP37MPS	The course as well depicts trends and the future development of mobile networks.     Modal Logics for Distributed Systems     distributed environment and "muddy children puzzle". Introduction of modal operators and their semantics based on possible ence between axioms and properties of possibility relation in the model. Knowledge in MAS. Common knowledge and agreed     Modelling and Simulation of Technological Systems     ter modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Grap     of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Examples of simulations.     Modern ICT for Industry and Smart Grids     Advanced Controlled Drives     CNS Modern Systems     Advanced Power Semiconductor Devices and ICs     cal structures. Development trends. Parameters and applications. Bipolar structures. MOS structures. BiMOS structures. High     New Control Methods for Electric Drives     to introduce students to the latest issues of control and regulation of electric drives, taking into account the focus of their docto     gy conversion parameters in electric drive systems and relevant power electronics, in particular by using modern control and     ctric AC drives, especially drives with asynchronous and synchronous motors.	ZK le-worlds model. I ment. Z,ZK bhic edited system mples of simulation ZK ZK ZK diodes. Schottky of voltage ICs, oper ZK ral work. Its purpor regulation algorith	4 Properties of 4 as and examples ons. Modelling of 4 diodes. Bipolar ation, principles, 4 see is to optimize hms. The course 4
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	Programmable IC Design	ZK	4
	to acquaint students with advanced methods of design, synthesis and verification of programmable systems and systems w		
	asic building elements, architecture and design procedures used to implement complex integrated systems, methods of desc	-	
	verification strategy, design and analysis of tests. This project-oriented course would with the use of state-of-the-art EDA too	ois to implement a	comprenensive
	I system whose application would be linked to the topic of the dissertation.	771	4
	CAD for RF and Microwave Circuits	Z,ZK	4
	onductor devices and transmission lines implemented in the PSpice class and similar programs. Hierarchy of the models of oth odel accuracy with artificial neural networks (ANN). Advanced algorithms for analysis and optimization of RF and microwave ci		
		ZK	4
	Nonlinear Systems continuation of the master level course "Nonlinear systems" being opened during winter semester. It is devoted to the deta	I I	-
	I design point of view. It is based on state space description of nonlinear systems. Model transformations will be studied to the detail		-
	gives mathematical conditions for the existence of these transformations. Nonlinear analougues of controllability and observab		-
-	to detectability and stabilizability investigated. Finally, elements of nonlinear output regulation as well as of nonlinear robust	-	
	be, in particular, based on MATLAB and SIMULINK use.		0
XP04N1	German language 1	NIC	
	emphasis on professional language. Listening to authentic technical texts from areas of electrical engineering, eliciting basic	information from t	he text. Reading
and analysis of profession	nal texts regarding the needs of postgraduate students. Training of various reading skills. Writing technical texts on specific	topics, CV, job ap	plications,
conversation lessons for	advanced students based on 5 video tapes about these topics: postgraduate studies, professions, internships abroad, profe	essional and scien	tific work, the
profession of an enginee	r. Revising and extending typical grammar for technical style, syntax of technical texts.		
XP04N1ZK	German language 1	ZK	0
Extending skills with the	emphasis on professional language. Listening to authentic technical texts from areas of electrical engineering, eliciting basic	information from t	he text. Reading
	nal texts regarding the needs of postgraduate students. Training of various reading skills. Writing technical texts on specific		
	advanced students based on 5 video tapes about these topics: postgraduate studies, professions, internships abroad, profe	essional and scien	tific work, the
	r. Revising and extending typical grammar for technical style, syntax of technical texts.		
	German language 2	NIC	
	n extending and elaborating grammar and conversation, namely on professional language skills (reading + writing technical	texts, preparing p	apers, reviews,
presentations etc.)ations			
	German language 2	ZK	0
	Neural Networks and Neurocomputers	ZK	4
	paradigm classification and artificial neural networks learning methods. Student is supposed to propose and test the application		
	ning his dissertation theme during the semester. Procedure and results would be concluded in the preliminary publication fo	rm designed to be	e presentable on
a scientific forum.			
XEP33NEP	Neuroprosthetics	Z,ZK	4
	erned with the use of artificial devices to replace or improve the function of the human nervous system. The neuroprosthetic	c device in most w	-
is the cochlea implant w			
	th approximately 150,000 in use worldwide. In this course we will look at the different technologies involved, particularly in te	-	
materials and their pract	cal 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
materials and their pract system and to directly st	cal use. We will also see how such implants interact with the human nervous system, forming a bidirectional gateway both to mulate the human brain. As well as witnessing the exciting development of the field we will consider neuroprosthetics in term	o monitor signals ns of practical res	on the nervous torative use, not
materials and their pract system and to directly st only in Cochlea implants	cal use. We will also see how such implants interact with the human nervous system, forming a bidirectional gateway both to mulate the human brain. As well as witnessing the exciting development of the field we will consider neuroprosthetics in term but also for visual and motor repair. We will however also look at the possibilities of Neuroprosthetics for general human end	o monitor signals ns of practical res hancement and in	on the nervous torative use, not vestigate how
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materials and their pract system and to directly st only in Cochlea implants the presenters own self follow (i.e. a mathematic course is complementary technology. XP14MEN The aim of the study is t their PhD thesis. Conten in the use of new princip using increasingly power unity power factor, active matrix converters, multi- XP14APR XP14APR XP14TPR XEP33NUM The course introduces to and partial) differential e Maple and computer gra XP33NUM The course introduces to partial) differential equat Maple and computer gra XP01NLA Background matrix algel value decomposition. Ge XP32NMR The subject deals with an Method, Boundary Elem background of the used XP17NME Poissonous, Helmoholtz	cal use. We will also see how such implants interact with the human nervous system, forming a bidirectional gateway both te mulate the human brain. As well as witnessing the exciting development of the field we will consider neuroprosthetics in term but also for visual and motor repair. We will however also look at the possibilities of Neuroprosthetics for general human en ixperimentation fits into the field. Whilst the course will focus on technical issues, it will be presented in a general way such al background is not a requirement). Indeed as this technology has immediate impact, societal, ethical and moral issues rais to the lecture course given on Bionics: this set of lectures being specifically concerned with neural aspects - linking the hum <b>New Trends in Converter Technology</b> to introduce students to the principles and functions of latest topologies of power semiconductor celectric energy converters, to of the subject is the optimization of the power conversion parameters in power semiconductor converter systems. The subjec es, topologies, functions and possibilities of application of power semiconductor converters realized on the basis of modern ful control microcomputers. The topics are focused on pulse width modulation methods for voltage and current control, mod control of the current curve and the voltage curve, as well as the overall quality of electric energy transmission. The probler evel converters, resonant converters as well as problems related to their practical use are also solved. <b>New Trends in Electric Device Apply</b> <b>Numerical Analysis</b> basic numerical methods of interpolation and approximation of functions, numerical differentiations and integration, solution ons and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demost phics. <b>Numerical Analysis</b> basic numerical methods of interpolation and approximation of functions, numerical differentiation and integration, solution ons and systems of linear systems. Kumerical linear alge	o monitor signals ns of practical res hancement and in that all students s an brain and nerv ZK aking into accoun ct is oriented main power semicondu es of operation of ms of analysis and ZK ZK Z,ZK n of transcendent a tration of their Z,ZK of transcendent a tration of their pro ZK sods. Matrix invers arical methods as to understanding the ZK ode Matching Tec	on the nervous torative use, not vestigate how hould be able to scussed. The rous system with 4 t the scope of ly on new trends ctor devices and converters with d synthesis of 3 4 and (ordinary properties using 4 ion. Singular 4 Finite Difference he mathematical 4 hnique, Point

XP35OFD	Estimation and Filtering	ZK	4
Methodology: experime	ht design, structure selection and parameter estimation. Bayesian approach to uncertainty description. Posterior probability de	nsity function and	point estimates:
	Robust numerical implementation of least squares estimation for Gaussian distribution. Parameter estimation and state filter	ing - Bayesian ap	proach. Kalman
filter for white noise. Pro	perties of Kalman filter. Kalman filter for colored/correlated noise.		
XP37ODS	Optical Design and Simulation	ZK	4
XP17OV	Optical Fibers	ZK	4
	ibers, attenuation and dispersion, step-index fibers, gradient fibers, single and f1ibers, optical cables, splices and connectors	, optical fibers me	asurements,
	nenomena in optical, fibers, fibers for sensors.	71/	
XP36PSV	Parallel Systems and Algorithms	ZK	4
	nd scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnect ation algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations.		
	utation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexit		-
	Computer Science and Informatics FEE CTU cannot register.	,,	· · · · g
XP01PDR	Partial Differential Equations	ZK	4
-	rential equations of mathematical physics. Initial and boundary value problems. The method of characteristic functions, integr	I I	
XP34PED	Advanced Electronic Devices	ZK	4
Energy band engineerin	g. Quantum well, wire, point. 2D electron gas based devices (HEMT, MOD FET). Devices based on resonance double-barrier t	unnelling. 3D stru	ctures. Quantum
device applications (me	mories, generators, multipliers). Heterogeneous structures. Microwave devices, HBT, Gunn diodes. Microwave device applica	ations. Heterogene	ous devices
with internal optical cou	pling. Cryotronic devices. Recording media. IC development trends.		
XP13PED	Plastics in Electrical Engineering	Z,ZK	4
	lectrical manufacturing. Exercise plastics in the production of the cables, structural members etc. The specialty requirements on t		
• •	shape constancy). Composite materials from out plastics. Technology treatment of plastics. Degradation of plastics impact of	•	hatic and the
· · ·	chemical resistance). The plastic waste. Recycling of plastics. Impact of production and the used up plastics on the environme		4
XP02PT	Plasma Technologies	ZK	4
XEP36AGT	Advanced Computational Game Theory	ZK	4
XP39PMV	Advanced Methods of Visualization	ZK	4
	ased on physical models. Scientific visualization and volume rendering. Volume graphics. Information visualization. Interaction		alization
	visualization in WWW environment. Particle models and visualization of technological processes. Computational fluid dynami		4
XP36POA	Advanced Parallel Algorithms time-, and cost-efficient PRAM algorithms and parallel algorithms for distributed memory machines. The collection of algorith	ZK ZK	-
	uted list ranking, Cole's MergeSort, optimal mesh sort, connected components, tree contraction and tree evaluation, pattern r		need parallel
XP34SRS	Semiconductor Radiation Sources	ZK	4
	semiconductors. Homogeneous and heterogeneous junction, double heterostructure lasers and LEDs. Non-coherent LED's, s	I I	
	n semiconductor lasers. Types of lasers and their properties. Waveguide lasers, DFB and BFR structures. SQW and MQW las	-	
injection lasers. Spectral	line width and line stability. Radiating characteristic, coupling of the radiation source to a waveguide. Bi-stable and memory elem	ents and switches	. Semiconductor
injection, waveguide am	plifiers and wave convertors. Lasers and non-coherent diodes for optical communications. Measurement methods, applicatio	ns.	
XEP33SAM	Understanding State of the Art Methods, Algorithms, and Implementations	ZK	4
	students will study selected sophisticated state of the art methods that have an efficient implementation publically available. T		-
	a successfully used in a number of applications. The goal for the students is to understand the method, to understand the implementation of applications will include two strands. The first strand will be similar to a reading group, the students		
· ·	a tool to solve other problems. The course will include two strands. The first strand will be similar to a reading group - the stud typically a published paper. In the second, practical component of the course, the students will use an implementation of the		
particular task.			
XP33PPD	Practical Data Mining Problems	ZK	4
	n solving of practical data mining problems. Lectures deal with data transformation, pre-processing and verification, selection of	I I	
	s evaluation and results interpretation. The attention is paid to solving of an individual data mining problem based on real-life		
lecturer.			
XP33PAD	Probabilistic Algorithms	ZK	2
-	is of statistic and probability. An analysis of the notion of non-deterministic algorithm. Effectivity criteria for non-deterministic a	-	
	ns. The probability of failure. Loss function. The expected risk. Probabilistic analysis of deterministic algorithms. Criteria for app	lication of probabi	listic algorithms.
	and their practical importance.	71/	
XP33PMD	Probabilistic Models of Uncertainty in Al		4 (Eastarization
	lity. Foundations of graph theory. Triangulated graphs and their characteristics. Information as a measure of dependence. Condit dence Lemma). Knowledge representation by multidimensional distributions. Qualitative knowledge represented by depender	-	-
	etworks. Decomposable models for computation in Graphical Markov models. Examples of application.		
XP37PKP	Biomedical Engineering in Clinical Practice	ZK	4
-	ttical problems that a biomedical engineer has to overcome in the clinical practice. Position of BME in research and in the clini	I I	
	s - design, conducting and evaluation, statistical analysis used in medicine. Thermodynamics of gas mixtures. Humidification	-	
of anaesthetical substar	nces. Systems with compressible fluids. Measurement of physical parameters in rigid and compliant systems. Basic parts of p	neumatic systems	in medicine (jet
	of airflow and pressure, gas blenders, etc.). Modelling and analysis of biological systems using electrical analogy, practical ap		-
	, biochemical sensors. Haematology analysers. Interference, corrections of measured values, standardisation in medicine. Ele		f internal organs
	lectrodes and circuits for biopotential measurement and electrical stimulation. Indirect measuring methods of biological and p		
XP36PAS	Algebraic Specifications Prototyping	ZK ZK	4
	syntax and semantics of a specification language (OBJ3), structured specifications, generic specifications, implementation o og, translation into Lisp, term rewriting systems, abstract rewriting machine, prototyping of a specification, prototyping in OBJ3,		
(C++).	יש, ממושמשה הוני בוסף, נכוחו ובשיותווש ששנכוהם, מששנימנו ובשיותוש והמטוחוב, ףוטנטנאףווש טו מ שפטווטמנוטוו, ףוטנטנאףווש ווו UDJ3, נ		Sauran language
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. Optic		-
	components. Interfaces. Systems of automatical self checking of quality. CNC machines appropriate for FMS. Manipulators ar		
FMS. Transport and its of	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
Types of networks and t	ransmission systems. Multiple overhead lines. Symmetrical components. Calculation of load flow. Analysis of faulted power s	ystems, different t	ypes of shunt
	nultaneous 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.		of the power
-	Methods for increasing of the stability in power systems. Multimachine transient stability. Reliability of the power transmission		
XP38PSL	Aircraft Instrumentation	ZK	4 ith mathada for
	tudents with the current technology used in aircraft with respect to instruments, systems and sensors working in the low-freq tem data. The course includes a detailed description of aircraft instrumentation and its resistance to external influences, a de		
	ineering, analysis of instruments and systems for measurement of engine and aerometric quantities, and a description of emerg	-	-
-	kground related to nowadays technology and methodology utilized on aircraft. The course provides a detailed overview of qu		-
and analytical methods	and their integration into signal/data processing and aircraft system design principles. The last part of the course discusses t	he current publish	ing activities in
the field of aircraft instru	imentation.		
XP38PUC		ZK	2
XP37RAD	Radioelectronics	ZK	4
XP36RSY	Reconfigurable Systems	ZK	4
Systems that have recor	figurability as a part of normal function. Technology of reconfiguration., partially reconfigurable devices. Reconfiguration contr	ol and manageme	nt, collaboration
	software support. Design and verification of reconfigurable systems, algorithms, EDA tools. Reconfiguration in System on Ch	ip (SoC). Codesig	n issues in SoC.
	with reconfigurable devices, case study, literature research.		
XP35RRD	Robust Control	ZK	4
	lected topics in robust control.	71/	4
XP33RSK	Robust Statistics for Cybernetics basic tools of control and decision making theory. Classical statistical methods (e.g. MLE) are usually very sensitive to deviat	ZK	4
	hich are robust have been developed. It means that these methods are not so sensitive to small deviations from an underlying		
	stimation and then we introduce the robust approach, some basic robust estimators of location (e.g. trimmed mean, Hampel	5	
	inction, breakdown point).	,	
XP33ROD	Pattern Recognition	ZK	4
	z/wiki/courses/xp33rod/start	· I	
XP04R1ZK	Russian language 1	ZK	0
XP04R1	Russian language 1	NIC	
The course is suitable for	or intermediate students who have an equivalent command of the language as someone who has completed book Raduga.	Course objective:	Acquiring the
language skills required	to get by in everyday situations and a basic understanding of straightforward technical texts.		
XP04R2	Russian Language 2	NIC	
-	cluding messages, summaries, business correspondence and dissertation theses; understanding lectures and other listening sk	ills; note-taking; or	al presentations;
	ation. Russian realia and the way of Russian life.Besides the course books, the supplementary texts and AV aids are used.		
XP04R2ZK	Russian language 2	ZK	0
XP16JAK	Quality Management	ZK	4
	e organization. Statistical methods in quality management. Models of quality systems. Economic issues in quality assurance.	Implementation of	requirements
	Certification of products and production systems. Recommendations for quality management in the organization.	71/	4
XP33RMD	Control of Mobile Robots	ZK	4 Instral Madalling
	pile Robots. Known Control Architectures. Top-Down and Bottom-Up Approaches. Overview and Comparison. Distributed Autor 1000 Mapping. Needed Sensors. Ground of Ethology. Imprinting. Taxe. Stimuli, Receptors. Multiple Motivated Behaviour. Reac		-
-	Robots Structure. Task- or Behaviour-Oriented Robots. Ways and Realisation of Robots Co-operation, Motivation, Observation	-	
	nt reinforcement Learning. Q-Learning. Action Selection Mechanism, Learning Method, Exploration Strategy. Emotional Lear		
Synthetic Biology. Artific	ial Life. Virtual World Different Approaches. Robots Competition, RoboCup, Strategy Selection, Implementation. Open Proble	ems.	
XP35CCM	Cooperative Control of Multi-agent systems	ZK	4
Cooperative distributed	control is a relatively novel and rapidly developing area of control theory and engineering. Instead of centralized, large system	ms are considered	l composed of
	s, with local computation and communication capabilities. The broad aim is solving classical problems e.g. stabilization, track	-	
	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	5	
	Theory: Review of qualitative properties of dynamical systems, Motivation for distributed multi-agent systems, Elements of all Consensus and synchronization of linear/nonlinear, continuous/discrete-time systems, Cooperative stability, optimality and rol		-
	y, Interactions with environment.		
XP32RTS	Telecommunications Systems Management	ZK	4
	stems Management is a discipline which deals problems of interactions of technical and business aspects of management of	I I	-
services provided.			
XP15RE	Control of Power Systems	Z,ZK	4
Objective functions of po	ower system control, feasibility and algorithms of optimization methods, handling of constrain conditions. Hierarchy and deco	· · ·	em controlling
tasks. System state esti	mation. Load forecasting and load curve civering. Unit commitment. Optimization of operation with respect to net topology co	nstrains.Control o	f voltage and
	e. Control of frequency and active powers balance. Optimal power flow. Dynamical models of power stations and systems. Sol	ution of extraordin	nary states
Dispatch, system and su			
XEP17SWR	Scientific Writing	ZK	4
This course is intended applicable to all technica	to help researchers organize and effectively communicate, in English, their scientific results. While the instructor is an Electricated disciplines	cal Engineer, the	approaches are
XP15SPS		7.74	1
	Coupled Problems in Heavy Current and Power Engineering roblem, classification of the coupled problems typical for heavy cur-rent and power applications. Mathematical description of	Z,ZK	4 cal fields links
	partial differential equations. Characteristics of electromagnetic-thermal problems (with respecting eventual thermoelasticity), elect		
	echanical problems and also problems based on a com-bination of the electromagnetic field and electric circuits. Formulation o	-	
-	of their solution. Information about available SW, its existing capabilities and perspectives.		•
XEP33VKR	Selected Topics in Pattern Recognition and Computer Vision	ZK	4
	undamental results from computer vision and pattern recognition. The course treats selected key results, as well as latest are	as of research, e	specially those
-	ence the development in the subject field. Education is performed in the form of a reading group. The course is mainly target	ing PhD candidate	es, but is also
available for Msc studen	ts with strong interest, possibly experience too, on a research topic that is relevant to the course.		

XP01SPJ	Syntax and semantics of a formal language	ZK	4
	a formal language. A simple imperative language, assignment command. Denotational and operational semantics, coheren	ice theorem. Math	ematical domain
theory. Fixed points of fu	nctionals, recursive definitions. Lambda - notation. A simple functionl language, denotational semantics. New functions defin	nitions, recursive c	onstructions.
· · · · · · · · · · · · · · · · · · ·	Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming	g language.	
	Computer Graphics Seminar	Z,ZK	4
	eminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface ma		
	nomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used in re		·
	uter vision and human computer interaction based on the particular topics of PhD theses of the participating students. The	-	is to introduce
	e students and by analyzing selected highly influential research publications to further develop the research capabilities of the	1 1	4
	Seminars on Architectures of Parallel Computers	ZK	4
	s of high-performance computers and trends in technologies. Memory coherence and sequential consistency models. Share I cache coherence protocols and synchronization mechanisms. Virtual shared memory architectures: distributed cache-cohe	-	
	Clusters: fast communication networks and protocols.	erence protocols.	Synchronization
		ZK	4
	Sensors and Buses luced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical prin	1 1	•
	of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration and		-
immunity.		alagineenee, nelee	
· · · · · · · · · · · · · · · · · · ·	Software in Industrial Engineering	Z,ZK	4
	BM compatible personal computers, their architecture. Using of application programs for mathematics, graphics, text process	1 · · ·	-
-	oduction to user interface based on Microsoft Windows.		,
	Special Methods of Devices Quality Evaluation	Z,ZK	4
	ncipal values determining the quality of the passive and active devices. Measuring methods, their evaluation, identification o		-
	ports parameters of the device. Matching of the device to the measuring circuit. The noise of the electronic circuits, optimal	-	-
Non-linearity of the "linea	ar" circuits, intermodulation distortion, measuring of the non-linearity and intermodulations.	·	U U
XP37SRP	Radio Receivers Special Technology	ZK	4
	radio receivers technology. Basic structure classical and modern software defined radio receivers. Technical parameters ra	dio receivers. Spe	cific features
	levision receivers. Professional radiocommunication receivers and transceivers. Diversity techniques. Spread spectrum radio		
and broadband amplifier	s. Oscillators and frequency synthesizers. Mixers and demodulators. Radio receivers system design.		
XP02SF	Statistical Physics	Z,ZK	4
The lecture is devoted to	the fundamentals of statistical physics. It is the third part of four-part lecture cycle.		
XP37SZS	Statistical Signal Processing	Z,ZK	4
Parameter estimation an	d detection theory. General properties and fundamental limits. ML, LS, Bayes (MAP,MSE), NP, MM estimators and detectors	s. Adaptive filter th	eory (Kalman,
RLS). Iterative detection	and parameter estimation.		
XP16STV	Product Strategy	ZK	4
Product and service poli	cy, pricing and contractation policy, communication, distribution. Marketing mix. Inovations. Concepts of marketing strategy.	Reverse marketing	J. Product
management. The strate	gic marketing simulation Markstrat.		
XP36STR	Stringology	ZK	4
	d sequences. General, ordered alphabet. Generalized and weighted strings. Finite and infinite alphabet. Searching in text, d		
	g. Forward and backward matching. Searching in compressed text. Searching in more-dimensional text. Searching for longest c	ommon factors and	d subsequences.
	s in text. Construction of covering of text. Representation of text, prefix, suffix and factor automata, suffix trees and arrays.	T	
	Structured Model Learning	ZK	4
	learning course covers learning and parameter estimation for structured models like Markov Random Fields, Belief Network	<s (stochastic)<="" and="" td=""><td>Deep Neural</td></s>	Deep Neural
Networks.			
	VLSI Structures and Technologies	ZK	4
	the IC's. Bipolar and unipolar structures. BiCMOS structures. 3D structures. Sub-micron structures. Memory structures. Test	-	31 technological
	miconductor technology. IC design, design of technology. Design rules. Reliability, yield. Outlooks and limitations of IC devel	· · · · · · · · · · · · · · · · · · ·	4
	Light sources and Equipment	Z,ZK	4
	Man-Machine Systems	ZK	4
	systems development. Human operator tasks. Manual control, supervisory control cognitive control. Typical structure of a cont	-	
	tor and machine. Control levels after Rasmussen. Skill based, role based and knowledge based operator behavior models.	-	-
	ntal models. Human-machine interaction. Intelligent interface. Factors influencing operator behavior. Stress. Mental load. Hui achine systems simulators. User-centered system design.		
· · ·		ZK	4
	Measurement and Data Acquisition Systems ne principles and technical means of data acquisition in the laboratory and industrial environment. Attention is paid to both h	1 1	-
-	s for data acquisition and process control. Laboratory exercises are designed in part in the form of classical tasks, partly in t		-
	ng of automated measurement systems and control of measurement processes.		
	Real Time Systems for Process Control	Z,ZK	4
	eal time control paradigm. Architecture of real time systems. State transition diagram of real time systems. Semaphore and de	1 1	•
in control of technologica			
-	Quality Control Systems	Z,ZK	4
	nd reliability. Basic quality management systems. ISO 9000, TQM, Kaizen. Basic characteristics of ISO 9000. Quality manua	1 1	-
	Arthematical model based on factor experiments. Optimization of mathematical model. Six Sigma quality management syst		
	stem. Reliability as a subset of quality. Mathematical distributions used in the field of reliability. Usage and maintenance coefficients and the statement of the	-	
mathematical description	n. Accelerated reliability testing. Processing and analysis of experimental data.		
XP04S1ZK	Spanish language 1	ZK	0
	Spanish language 1	NIC	0
	dge of Spanish language, including the language for specific purposes. Specific technical style characteristics focused on sp	1	-
-	sentations, understanding the text-all based on intermediate level language.	-	Ū
XP04S2ZK	Spanish language 2	ZK	0
	Spanish language 2	NIC	0
	ening, understanding a Spanish text of cca 120 pages, writing, speaking). The skills are practiced on writing letters, presentation of the state of	1 1	-
	paration is necessary. Materials are chosen with regards to the study field of a postgraduate. High-level and fluent speech is		

XP37TMP Medical Instrumentation	ZK	4
The subject deals with principles and properties of medical systems for analysis of body fluids, blood gas analysis, medical minors of basic life funct etc.), thermodynamic principles of anaesthetic equipment and equipment for artificial lung ventilation, haematological analysers and other medical a		oxymetry EEG,
XP13TND Technology of Low Temperatures and Superconductivity	Z,ZK	4
Thermodynamic principles of cooling. Equipments for achievement of low temperatures, liquifiing of gases. Ultralow temperatures. Properties of isot	· · · ·	-
Physical properties of solids at low temperatures. Principles of superconductivity theory, transport currents, stability of superconductivity state, weak		
phenomena. Properties and technology of metallic and high temperature superconductors. Thermal insulation of low temperature equipments. Low tem	perature thermome	etry. Accessories
and work in low temperature laboratory. The use of low temperature technology in practice.         XP17TVC       Technique of Highly Sensitive Receivers	ZK	4
Design of highly sensitive microwave receivers, mm - wave and submm - wave receivers. Electromagnetic spectrum and noise properties of the Ear	1 1	-
Microwave, millimetre wave communication. Semiconductors for microwave and millimetre wave bands, SIS detectors, mixers, infrared receivers. High		eters technology,
measurement of noise parameters. Multispectral radiometry and remote sensing, electromagnetic radiation - interference, EMC theory and measure		
XP13TMD Technological Aspects of Microcomputer Design	Z,ZK	4
Industrial microcomputers, modular design and hardware solution. The data storage technology. The data storage media. The device protection aga cooling and air condition of equipments. The human machine interface - input and output devices. The ergonomic design of microcomputers and specified and specified are specified as a specified		
microcomputer systems, criteria. The quality control of design and services, the quality of software. The legal aspects of microcomputer use. The co		
microcomputers.		
XP13TPD Technological Processes in Electronic Manufacturing	Z,ZK	4
Development of technology of packaging. Contemporary methods of packaging of components SOP, DIP, SIP, ZIP, QFP and others, properties, advan of packages from the viewpoint of environmental resistivity. Classification of multichip modules. Multichip modules of different types: MCM-L, MCM-C		
multichip modules. Technology of contacting og dies. Electrical design of MCMs. Thermal design of MCMs. Physical design of MCMs. Parameters fo		
of MCMs. Design tools. Programmable modules. Applications of MCMs.		
XP34TOS Technology of Optical Devices	ZK	4
Preparation of optoelectronic materials and structures. Diagnostic and testing methods. Design and preparation of double heterostructures. Preparation of double heterostructures.		-
Preparation of LED's, lasers, photo-resistors. Preparation of QW structures. Design of dielectric waveguide structures. Preparation of dielectric wave preparation of optical radiation distributing structures. Design and preparation of optical radiation control structures. Measurement methods. Testing me	-	-
structures. Examples of dielectric structures.	sinous. Examples c	or semiconductor
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	ocal transducers w	ith magnetic and
electric field. Non-reciprocal transducers (opto and thermoacoustical transducers, piezoresistive transducer). Electromechanical and electroacousti		-
distributed elements. Radiation, radiation impedance. Acoustic transmitters, directivity. Acoustic receivers. Acoustical systems with lumped and distribut air-gaps. Coupled systems.	ed elements. Acou	stic waveguides,
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 Mecha	1 1	-
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.	774	4
XP37TAS Acoustic signal processing and theory Acoustic signal classification, sources, description of properties. Statistical analysis of acoustic signals. Spectral analysis of signals, Fourier transfor	Z,ZK	4 e-frequency
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. Di		musical signals.
XP01TGR Graph Theory	ZK	4
Basic course in graph theory. Trees, their characterization, minimal spanning tree. Strongly connected components, rooted trees. Shortest paths, Flot their applications, Hamiltonian graphs and their applications. Chvatal's theorem. Flow in networsk, admissible flows and admissible circulations. Mat		
bipartite graphs. Vertex cover and independent sets. Cliques. Colorings. Plannar graphs. Graphs and vector spaces. The content of the course is mo	0 0 0	
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 Chomsky hierarchy. CYK algorithm for context-free grammars. Turing machines, decision problem. Algorithmically nonsolvable problems.	ssincation. Colnexi	-nee grammars.
XP15TOS Theory of Light field	Z,ZK	4
Theory of light field. Mathematical description of emission of unsymmetrical luminaires. Photometry of distante and close point. New characteristics	1 1	s of illumination.
Flux method calculation of integral characteristics. Light field of surface type and cube type luminaire. Light flux distribution from point source. Distribution	bution of light flux of	of linear source.
Distribution of light flux of surface source. Interreflection theory. Design of indoor illumination using PC.		
XP32TPZ   Teletraffic Theory 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). I	ZK	4
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 diffe	-	
telecommunication networks deploying and operating at time being. Theoretical knowledge about models of service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the service systems can be utilized for dimensional differences of the		
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 r classification - spectral distances, Markov models, neural nets, signal prediction.	nodels, LPC cepst	rum. Signal
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 and	1 1	-
from the prime laws of fluid dynamics. These equations are utilized for derivation of a linear wave equation under the acoustical approximation; its sp	pecial solutions are	e discussed.
General solutions of the wave equation and Helmholtz equation are formulated using the integrals of Kirchhoff-Helmholtz and Rayleigh. Using these in	itegrals, some prob	lems of acoustic
radiation and diffraction are studied. Problem of the acoustic field description is further developed using the methods of Fourier acoustics.	71/	Λ
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 a	ZK and measurements	4 of temperature
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 m	nodels.	
XP33TTM Text mining	7K	4

	It was a sum of a walk of the second s	71/	
	Ultrasound and Quantum Acoustics	ZK	4
The purpose of these led	tures is to familiarize doctoral students with the issues of ultrasonic waves needed for the design of a wide range of ultrason	ic devices and to	discuss in detail
the parts that the doctor	I 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
	•		•
-	es. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving,	-	-
and informedness of the	earch algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creatio	n of knowledge ba	ases. Knowledge
acquisition, induction fro	n examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of pattern recog	gnition.	
XP01UAG	Introduction to Algebraic Geometry	ZK	4
	ution sets of systems of polynomial equations in more than one variable and their relationship with the ideals in polynomial		
basis theorem, Groebne	's bases and their properties, Buchberger's algorithm for searching a Groebner's basis, elimination theory, Hilbert's Nullstell	ensatz, correspo	ndence between
varieties and radicals.			
XP02UFL	Introduction to Laser Physics	ZK	4
	-		•
The subject introduces the subject introduces the subject introduces the subject introduces the subject interview of the	e basics of laser physics. It explains the principle of laser operation, presents basic terms and describes in detail individual	types of lasers, ir	ncluding their
construction, characteriz	es the main properties of laser radiation and briefly indicates the possibilities of creating short pulses of radiation. The next p	part focuses on th	e use of lasers
in various areas of huma	n activity. It also lists safety principles for working with lasers. In the practical part, it is supplemented by visits to top workpla	ces (e.a. PALS, E	LI. HILASE)
dealing with the given is		(	,,
XP01UNA	An introduction to nonassociative algebras	ZK	4
The basic course in the	neory of nonassociative algebra. We introduce the otions of free nonassociative algebra, tensor algebra, bimodules and irep	resentations for a	algebras in a
	ntion on the ariety of alternative algebras and composition algebras. We define Lie, alcev and Jordan algebras, their univers		-
	An introduction to superalgebras.	ZK	4
The basic course in the t	neory of superalgebras. We introduce notions of a graded algebra, superalgebra, Grassmann envelope of a superalgebra. Co	onsider varieties o	of superalgebras
and identities in superald	ebras. We pay a big attention on the variety of alternative and Jordan superalgebras.		
		7 71/	Λ
	Electric Energy Use and Conservation	Z,ZK	4
XP13VTK	Vacuum technology and cryogenics	Z,ZK	4
	us processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Princ	,	nd constructions
	nievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating sys	,	•
temperature thermometr	Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum	technology and	cryogenics.
XP37VRA	Research Seminars in Radioelectronics and Acoustics	Z,ZK	4
-		,	-
	r PhD students of the radioelectronics and acoustics specialization. It develops the presentation skills and serves as a platform	orm for discussion	and detence of
students' research result	L Contraction of the second seco		
XP39VR	Virtual reality	ZK	4
	ا VRML language. Standard and non-standard extensions to the VRML language. Programming of external applications with		
		EAT Internace. M	uili-usei virtuai
reality. Distant cooperation	n in virtual environment. Hardware and software support for virtual reality systems. QuickTime VR. Specification X3D.		
XP02VNP	Plasma Waves and Instabilities	Z,ZK	4
	vill be introduced in the first part of the lecture (dispersion relation, phase and group velocities, Fourier analysis). Fundamer		
will be derived from the I	nearized MHD equations (magnetoacoustic waves - Alfven, F and S wave; electromagnetic waves in plasma - O, X, R, L wa	ve, CMA diagram	i). The second
part of the lecture will be	devoted to final size waves, nonlinear phenomena (Landau damping) and solitons in plasma.		
XP16DEL	History of technology and economic	ZK	2
	· · ·		
XP37VKF	Selected Parts from Photonics	ZK	4
Anatomy and physiology	of vision. Integral photonic sensors. Panoramatic (image) photonic sensors. Integral photonic displays. Panoramatic photoni	c displays. Electro	on optics. Image
	nic elements. Basic elements of optical systems. Fundamentals of illumination. Fiber-optics elements and systems. Optical m		
			ation processing.
Optical (photonic) proce	sors.		
XP38VKP	Selected Parts of Instrumentation	ZK	
	o principle, properties and applications of selected special measuring instruments. It deals mainly with calibrators and other		4
		r sources of calib	ration signals,
analyzers, metallic and o	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC m	r sources of calib neasurements, rea	ration signals, al-time spectrum
		r sources of calib neasurements, rea	ration signals, al-time spectrum
	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me	r sources of calib neasurements, rea thods and virtual	ration signals, al-time spectrum instrumentation.
XP01TEM	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me Selected chapters of the measure theory	r sources of calib neasurements, rea thods and virtual ZK	ration signals, al-time spectrum instrumentation. 4
XP01TEM Basic properties of finete	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC m otical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me Selected chapters of the measure theory ly additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the	r sources of calib neasurements, rea thods and virtual ZK	ration signals, al-time spectrum instrumentation. 4
XP01TEM Basic properties of finete	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me Selected chapters of the measure theory	r sources of calib neasurements, rea thods and virtual ZK extension of finat	ration signals, al-time spectrum instrumentation. 4
XP01TEM Basic properties of finete measures (the Horn-Tars	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC m stical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me Selected chapters of the measure theory ly additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem.	r sources of calib neasurements, rea thods and virtual ZK extension of finat	ration signals, al-time spectrum instrumentation. 4
XP01TEM Basic properties of finete measures (the Horn-Tars XP33KSI	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement mediate solution of the measure theory low additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem.	r sources of calib neasurements, rea thods and virtual ZK extension of finat ZK	ration signals, al-time spectrum instrumentation. 4 ely additive 4
XP01TEM Basic properties of finete measures (the Horn-Tars XP33KSI XP38VKZ	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me Selected chapters of the measure theory ly additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Sotware Engineering - Selected chapters Selected Chapters of Signal Processing	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK ZK	ration signals, al-time spectrum instrumentation. 4 ely additive 4 4 4
XP01TEM Basic properties of finete measures (the Horn-Tars XP33KSI XP38VKZ	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement mediate solution of the measure theory low additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem.	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK ZK	ration signals, al-time spectrum instrumentation. 4 ely additive 4 4 4
XP01TEM Basic properties of finete measures (the Horn-Tars XP33KSI XP38VKZ The course is dedicated	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me Selected chapters of the measure theory ly additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Sotware Engineering - Selected chapters Selected Chapters of Signal Processing	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK ZK e.g. the other type	ration signals, al-time spectrum instrumentation. 4 ely additive 4 4 ss of integral
XP01TEM Basic properties of finete measures (the Horn-Tars XP33KSI XP38VKZ The course is dedicated transformation (except F	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me Selected chapters of the measure theory ly additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Sotware Engineering - Selected chapters Selected Chapters of Signal Processing o advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns effectives and measuring instruments.	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK ZK e.g. the other type	ration signals, al-time spectrum instrumentation. 4 ely additive 4 4 ss of integral
XP01TEM Basic properties of finete measures (the Horn-Tars XP33KSI XP38VKZ The course is dedicated transformation (except F transmission, etc.	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC methods and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement method solve the measure theory and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Sotware Engineering - Selected chapters Selected Chapters of Signal Processing o advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns envire), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality in	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK a.g. the other type ncreasing of mult	ration signals, al-time spectrum instrumentation. 4 ely additive 4 s of integral imedia signal
XP01TEM Basic properties of finete measures (the Horn-Tars XP33KSI XP38VKZ The course is dedicated transformation (except F transmission, etc.	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC motical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement me Selected chapters of the measure theory ly additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Sotware Engineering - Selected chapters Selected Chapters of Signal Processing o advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns effectives and measuring instruments.	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK ZK e.g. the other type	ration signals, al-time spectrum instrumentation. 4 ely additive 4 4 ss of integral
XP01TEM Basic properties of finete measures (the Horn-Tars XP33KSI XP38VKZ The course is dedicated transformation (except F transmission, etc. XP38VDI	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC methods and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement method solve the measure theory and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Sotware Engineering - Selected chapters Selected Chapters of Signal Processing o advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns envire), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality in	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK e.g. the other type ncreasing of mult ZK	ration signals, al-time spectrum instrumentation. 4 ely additive 4 es of integral imedia signal 4
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XP01TEM Basic properties of fineter measures (the Horn-Tars XP33KSI XP38VKZ The course is dedicated transformation (except F transmission, etc. XP38VDI This course introduces a of non-destructive testing	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC method is the effectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement method is gima-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Solvare Engineering - Selected chapters Selected Chapters of Signal Processing o advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns envire), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality in Selected Chapters of Diagnostics twanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, an , the corresponding advanced signal processing, and self-acting evaluation in order to improve reliability, availability, mainte	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK e.g. the other type ncreasing of mult ZK ad principles and nance, and life-ti	ration signals, al-time spectrum instrumentation. 4 ely additive 4 es of integral imedia signal 4 instrumentation me.
XP01TEM Basic properties of fineter measures (the Horn-Tars XP33KSI XP38VKZ The course is dedicated transformation (except F transmission, etc. XP38VDI This course introduces a of non-destructive testing	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC methods and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement methods selected chapters of the measure theory low additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Sotware Engineering - Selected chapters Selected Chapters of Signal Processing o advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns e purier), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality in Selected Chapters of Diagnostics dvanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, and	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK e.g. the other type increasing of mult ZK ad principles and	ration signals, al-time spectrum instrumentation. 4 ely additive 4 es of integral imedia signal 4 instrumentation
XP01TEM Basic properties of fineter measures (the Horn-Tars XP33KSI XP38VKZ The course is dedicated transformation (except F transmission, etc. XP38VDI This course introduces a of non-destructive testing XP36VPD	of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC method is the effectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement method is gima-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the ki technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem. Solvare Engineering - Selected chapters Selected Chapters of Signal Processing o advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns envire), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality in Selected Chapters of Diagnostics twanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, an , the corresponding advanced signal processing, and self-acting evaluation in order to improve reliability, availability, mainte	r sources of calib neasurements, re- thods and virtual ZK extension of finat ZK e.g. the other type ncreasing of mult ZK ad principles and nance, and life-tin ZK	ration signals, al-time spectrum instrumentation. 4 ely additive 4 es of integral imedia signal 4 instrumentation me. 4
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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
Properties of light, wave	equation, plane wave, polarization, reflection and refraction, natural and artificial anisotropy, optical modulators, coherence, inter		interferometers,
diffraction, optical gratin	g, holography, methods of visualization, normal and anomalous dispersion, optical image formation, optical devices, photometers	etry, colorimetry, a	atoms radiation,
stimulated emission, las			
XP33ROZ	Selected Topics in Pattern Recognition	ZK	4
	rse in pattern recognition (e.g. P33ROD, 33RPZ). Selected topics: Anderson's problem, Kozince algorithm, kernel perceptror		
	. Deterministic learning. Unsupervised learning: Robbins algorithm and emprirical Bayesian approach. Expectation-minimiza	tion algorithm. Re	cognition of
XP16MVE	acyclic graphs. Markov models. Combination of weak classifiers: boosting and bagging. AdaBoost.	71/	4
	Selected Problems of Economy and Management of Energy rocess in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning wi	ZK	4
	roduction management, standardization. Controlling, production management methods.	in respect to prod	uction typology.
XP37SFA	Fundamentals of Physical Acoustics	ZK	4
	icity, Carthesian tensors. Theory of small deformations, dynamic equations of isotropic elastic medium. Microscopic model of		
Dynamics of vascous flu	uids. Stationary flow of vascous fluid.		
XP16STM	Selected Statistical Methods	ZK	4
Descriptive statistics.Tra	nsformation of random variables. Aproximation of theoretical distributions. Interval estimates. Hypothesis testing. Simple and m	ultiple regression.	Analysis of time
series.Index number.			
XP39VPG	Computational Geometry	ZK	4
	nal geometry (CG), data structures and paradigms, methods of geometric search, convex polygons and hulls, applications o		
	gulation, efficient intersection algorithms, intersection of semispaces and polygonal regions, geometry of rectangles, dual ma	ppings and space	s, convex hull in
	of computer graphics and CG. Students who completed course 36VGE cannot enroll.	71/	4
XP36VAP	Advaced Computer Architecture	ZK	4
-	ism (pipelined, superpipelined and superscalar systems). Basic limitations to parallelism (structural, data and control hazards		
	order). Register data flow, software and hardware solutions, interlocking, scoreboard, control stack. Memory reuse, register rer mace evaluation, HPCC, supercomputers. Shared memory multiprocessors (bus, switch, switched memory). Interconnection	-	
	pocessor systems. MIMD systems UMA, NUMA, COMA. Distributed memory multiprocessors (crossbar switch). Data flow systems		
special architectures.		,	.g,
XP12VVM	Development and Research of Materials	Z,ZK	5
	materials with specific electrical properties. Diagnostics of materials in electrotechnology. Polymers. Phase transitions. Thin a		e layers on
polymers. Organic solar	cells. Models of function of biomaterials.		
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-ae	-	
-	athematical modeling. Analytical solutions of electromagnetic field. Discrete parameters and their relation with field parameters.	Numerical access	s to deterministic
_	of fields. Non-deterministic modeling. Experiment and data processing, practical examples.		
XP02ZFP	Fundamentals of the Plasma Physics	ZK	4
model Magneto-hydrod	you with a basic knowledge of plasma physics and of its applications. Plasma definition. Main plasma characteristics. Collision	ons of charged pa	rticles. Fluid
XP33ZPM		ZK	4
XP33ZVD	Introduction to Computer Vision	ZK	4
	ist anymore. Its last lecture run in the academic year 2021/2022.	۷۲	4
XP01ZWT	Wavetet Transform.	ZK	4
-	bus wavelet transform. Time and frequency localization. Discrete wavelet transform. Riesz bases and frames. Multiresolution		
processing.		analysis. Applicat	ions to signal
XP37ZI	Information recording	Z,ZK	4
	bry. FM signal recording. Video information recording systems. High density recording, tape recorder thin heads. Impulse reco		
	DAT. Digital recording on CD-ROM, CD-video. WORM, CD-R recording. Erasable magneto-optical recording on MD. Digital vi		- 1
compression.			
XP31ZBS	Biological Signal Processing	ZK	4
The course deals with the	he processing of biosignals and advanced methods of processing resulting from current research in solving common projects	in cooperation wit	h top institutions
(medical faculties, institu	utes of the ASCR, foreign universities). The subject concept allows us to respond flexibly to new directions and knowledge in	the field.	
XP37ZSN1	Signal processing in satellite navigation systems 1	Z,ZK	4
	with pseudorandom signals and with carrier. Position determination based on measured distances. Time delay discriminator.	Schema of range	navigation
	HDOP, VDOP. GPS system, precision. Glonass and its precision. GALLILEO. Comparison of these systems.		
XP37ZSN2	Signal processing in satellite navigation systems 2	Z,ZK	4
	tion systems, structure of receiver and precision of position measurement. Shortcomings of satellite systems: limited access		
	al systems DGPS and DGLONASS, RTCM-104 standard. Systems SKY-FIX, FUGRO, RACAL, WAAS, EGNOS. GALILEO a		
XP33VID	3D Computer Vision ive geometry, perspective camera. Fundamental and essential matrices, their robust estimation, camera calibration. Correspo		4 structure from
	c vision problem, cyclopean representation, disparity, disparity gradient limit, ordering constraint, four basic formulations of the	-	
	uction from stereovision, error propagation, examples. Physics of image reflection, image irradiance equation, basic reflectan	-	
	blem. Local shading analysis. Overview of other Shape-from-X methods. Up-to-date info at https://cw.felk.cvut.cz/doku.php/c		
-			

## List of courses of this pass:

Code	Name of the course	Completion	Credits
XEP17SWR	Scientific Writing	ZK	4
This course is intend	ded to help researchers organize and effectively communicate, in English, their scientific results. While the instructor is an Electrical applicable to all technical disciplines.	Engineer, the app	roaches are
XEP33FLO	Fuzzy Logic	ZK	4
VEDOONED	Basics of fuzzy sets and fuzzy logic. Measures on collections of fuzzy sets. Principles of fuzzy control.	7 71/	4
XEP33NEP	Neuroprosthetics s concerned with the use of artificial devices to replace or improve the function of the human nervous system. The neuroprosthetic d	Z,ZK	4
•	ant with approximately 150,000 in use worldwide. In this course we will look at the different technologies involved, particularly in tern		
-	practical use. We will also see how such implants interact with the human nervous system, forming a bidirectional gateway both to n		
system and to direct	tly stimulate the human brain. As well as witnessing the exciting development of the field we will consider neuroprosthetics in terms of	of practical restorat	tive use, not
	plants but also for visual and motor repair. We will however also look at the possibilities of Neuroprosthetics for general human enha		-
	self experimentation fits into teh field. Whilst the course will focus on technical issues, it will be presented in a general way such that ematical background is not a requirement). Indeed as this technology has immediate impact, societal, ethical and moral issues raise		
	entatical background is not a requirement). Indeed as this technology has infinediate impact, societal, ethical and inoral issues raise entary to the lecture course given on Bionics: this set of lectures being specifically concerned with neural aspects - linking the human technology.		
XEP33NUM	Numerical Analysis	Z,ZK	4
The course introdu	ices to basic numerical methods of interpolation and approximation of functions, numerical differentiations and integration, solution	of transcendent and	d (ordinary
and partial) different	tial equations and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demons	tration of their prop	erties using
	Maple and computer graphics.		
XEP33SAM	Understanding State of the Art Methods, Algorithms, and Implementations	ZK	4
	PhD students will study selected sophisticated state of the art methods that have an efficient implementation publically available. The peen successfully used in a number of applications. The goal for the students is to understand the method, to understand the implem		-
	on as a tool to solve other problems. The course will include two strands. The first strand will be similar to a reading group - the stud		
-	rial, typically a published paper. In the second, practical component of the course, the students will use an implementation of the disc		
	particular task.		
XEP33SML	Structured Model Learning	ZK	4
This advanced mad	chine learning course covers learning and parameter estimation for structured models like Markov Random Fields, Belief Networks	and (stochastic) De	eep Neural
	Networks.		
XEP33VKR	Selected Topics in Pattern Recognition and Computer Vision	ZK	4
		of an an an a la series a	
	vith fundamental results from computer vision and pattern recognition. The course treats selected key results, as well as latest areas		-
	r influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeting		-
which substantially	y influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeting available for Msc students with strong interest, possibly experience too, on a research topic that is relevant to the course.	g PhD candidates,	but is also
which substantially XEP35CMS	r influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeting	g PhD candidates,	but is also
which substantially XEP35CMS	y influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeting available for Msc students with strong interest, possibly experience too, on a research topic that is relevant to the course. Computational Methods for Materials Science	g PhD candidates, Z,ZK Science field. At th	but is also 4 e end of the
Which substantially XEP35CMS	y influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeting available for Msc students with strong interest, possibly experience too, on a research topic that is relevant to the course. Computational Methods for Materials Science course is to acquire advanced knowledge of Classical and Quantum Mechanics to design in-silico experiments within the Materials lents will know: - the fundaments of thermodynamics, newtonian and statistical mechanics, and how the relative formalism is implem properties; - how the Schrödinger equation is setup and solved in order to calculate physical quantities; - how to combine the classic	g PhD candidates, Z,ZK Science field. At th ented in order to c al and quantum me	but is also 4 e end of the calculate echanics to
Which substantially XEP35CMS	v influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeting available for Msc students with strong interest, possibly experience too, on a research topic that is relevant to the course. Computational Methods for Materials Science course is to acquire advanced knowledge of Classical and Quantum Mechanics to design in-silico experiments within the Materials lents will know: - the fundaments of thermodynamics, newtonian and statistical mechanics, and how the relative formalism is implem properties; - how the Schrödinger equation is setup and solved in order to calculate physical quantities; - how to combine the classic results; and - a general protocol through which to design new materials at the atomic scale. By means of simulation laboratory experience	g PhD candidates, Z,ZK Science field. At th ented in order to c al and quantum me	but is also 4 e end of the calculate echanics to
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which substantially         XEP35CMS         The final goal of the course, the stud thermodynamical p model experimental         XEP36AGT         XEP36AGT         XP01FA1         XP01ITZ         Basic types of interesting	y influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targeting available for Msc students with strong interest, possibly experience too, on a research topic that is relevant to the course. Computational Methods for Materials Science course is to acquire advanced knowledge of Classical and Quantum Mechanics to design in-silico experiments within the Materials lents will know: - the fundaments of thermodynamics, newtonian and statistical mechanics, and how the relative formalism is implem properties; - how the Schrödinger equation is setup and solved in order to calculate physical quantities; - how to combine the classic results; and - a general protocol through which to design new materials at the atomic scale. By means of simulation laboratory experier learn how to setup and run simulations, and how to analyse and present the results by using post-processing softwares. Advanced Computational Game Theory Functional Analysis 1 Measure theory and Lebesgue integral. An introduction to Hilbert spaces. Theory of linear operators in Hilbert spaces. Spectral	g PhD candidates, Z,ZK Science field. At the ented in order to c al and quantum me nee, the students w ZK ZK theory. ZK ial equations. Intro	but is also 4 e end of the alculate echanics to ill eventually 4 4 4 duction to
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which substantially           XEP35CMS           The final goal of the course, the stud thermodynamical p           model experimental           XEP36AGT           XP01FA1           XP01FA1           XP01FA1           XP01FA1           XP01FA1           XP01FA1           Quantur computing problems. This sa           XP01KAS           Time and space com           XP01KVP           Quantum computing problems. This sa           XP01MKR           XP01MKR           XP01MST           Random sampling est           XP01MTP           Similar matrices. Jor exponential matrix. S           XP01MTS	y influence the development in the subject field. Education is performed in the form of a reading group. The course is mainly targetim- available for Msc students with strong interest, possibly experience too, on a research topic that is relevant to the course. Computational Methods for Materials Science course is to acquire advanced knowledge of Classical and Quantum Mechanics to design in-silico experiments within the Materials lents will know: - the fundaments of thermodynamics, newtonian and statistical mechanics, and how the relative formalism is impleer properties; - how the Schrödinger equation is setup and solved in order to calculate physical quantities; - how to combine the classic results; and - a general protocol through which to design new materials at the atomic scale. By means of simulation laboratory experier learn how to setup and run simulations, and how to analyse and present the results by using post-processing softwares. Advanced Computational Game Theory Functional Analysis 1 Measure theory and Lebesgue integral. An introduction to Hilbert spaces. Theory of linear operators in Hilbert spaces. Spectral Integral Transforms and Z Transform egral transforms, linearity. Laplace transform, inversion, limit theorems. Fourier transform. Application to solving integral and different fourier and Laplace transforms of distributions. Linear dynamic systems, causality, passivity, convolution. Systems with bounded spectr equations. Complexity and Combinatorical Algorithms nplexity of algorithms. P and NP problems and their solutions: exact solutions, heuristics, approximation schemes, probabilistic algorit fety may be broken by quantum computers. The ``building stones'' of a quantum computer and quantum computers will be develope design fast factorization algorithms, fast database search, etc. Mathematical Statistics g, ordered sampling and their distributions. Sample statistics. Point estimates and interval estimates. Nonparametric tests. Regress Matrix Calculus grade sampling and their distribution pa	g PhD candidates, Z,ZK Science field. At the ented in order to call and quantum me ince, the students with ZK ZK theory. ZK ial equations. Intro um. Z-transform an ZK hm. Equivalences of ZK lexity of classical me d during the course ZK lexity of classical me d during the course ZK ion analysis. ZK hoore-Penrose pso- ZK	but is also 4 e end of the calculate echanics to ill eventually 4 4 duction to ad difference 4 of problems. 4 cathematical e. We will 4 consistent 4 of matrices, eudoinverse 4

XP01NLA Background matrix algeb	Numerical Linear Algebra ZI	
Eachground mann algos	ra. Norms of vectors and matrices. Numerical linear algebra. Special systems. Eigenvalues and eigenvectors. Iterative methods. Matrix	
	value decomposition. Generalized solutions of linear systems.	inversion. Onig
XP01PDR	Partial Differential Equations ZI	K
	ntial equations of mathematical physics. Initial and boundary value problems. The method of characteristic functions, integral form and r	1
XP01SPJ	Syntax and semantics of a formal language ZI	
	formal language. A simple imperative language, assignment command. Denotational and operational semantics, coherence theorem. M	1
theory. Fixed points of fur	nctionals, recursive definitions. Lambda - notation. A simple functionl language, denotational semantics. New functions definitions, recur	rsive construction
Operational ser	nantics. Other approaches to semantics, continuation semantics. Axiomatic (Hoare's) semantics. Expressive power of a programming la	anguage.
XP01TEM	Selected chapters of the measure theory ZI	K 4
Basic properties of finete	ely additive and sigma-additive measures, classic results (the Radon-Nikodym theorem and the Carathéodory theorem), the extension of	of finately addit
r	neasures (the Horn-Tarski technique, the Banach limit method, some questions of the lifting, etc.), the Hammer-Sobczyk theorem.	
XP01TGR	Graph Theory ZI	K 4
	ory. Trees, their characterization, minimal spanning tree. Strongly connected components, rooted trees. Shortest paths, Floyds algorithn	
	onian graphs and their applications. Chvatal's theorem. Flow in networsk, admissible flows and admissible circulations. Matchings in ger	
pipartite graphs. Vertex co	over and independent sets. Cliques. Colorings. Plannar graphs. Graphs and vector spaces. The content of the course is modified accord	ling to the need
	students.	
XP01TJA	Languages, Automata and Grammars	1
	orem and its applications. Nondeterministic automata. Regular expressions nad Kleene theorem. Grammars and their classification. Cot	inext-free grami
	msky hierarchy. CYK algorithm for context-free grammars. Turing machines, decision problem. Algorithmically nonsolvable problems.	
XP01UAG	Introduction to Algebraic Geometry	
	tion sets of systems of polynomial equations in more than one variable and their relationship with the ideals in polynomial rings, Dickso bases and their properties, Buchberger's algorithm for searching a Groebner's basis, elimination theory, Hilbert's Nullstellensatz, corre-	
asis theorem, Groebhers	varieties and their properties, buchberger's algorithm for searching a Groebher's basis, einmination theory, million's hullstellensatz, cone	spondence bei
XP01UNA	An introduction to nonassociative algebras ZI	K
	heory of nonassociative algebra. We introduce the otions of free nonassociative algebra, tensor algebra, bimodules and irepresentation	
	attention on the ariety of alternative algebras and composition algebras. We define Lie, alcev and Jordan algebras, their universal envelo	•
XP01USA		
	An introduction to superalgebras.	
	and identities in superalgebras. We pay a big attention on the variety of alternative and Jordan superalgebras.	lies of superaige
XP01VPS	Selected topics in probability and mathematical statistics         ZI	K
	Students will learn the terms of probability and procedures of mathematical statistics that go beyond commonly taught methods.	
XP01ZWT	Wavetet Transform.	K
-	us wavelet transform. Time and frequency localization. Discrete wavelet transform. Riesz bases and frames. Multiresolution analysis. Ap	- 1
	processing.	
XP02AMA	Active Methods in Acoustics ZI	
Physical principles, interfe	erence, Huygens principle, sound field in ducts, vawe-guides and enclosures. Active noise control in a duct. One or more secondary sou	K Active co
enclosures, acoustic cou	erence, Huygens principle, sound field in ducts, vawe-guides and enclosures. Active noise control in a duct. One or more secondary sou pling, modes, local control. Feedback and feedforward strategy, analog adn digital realisations, algorithms based on LMS, stability of algo algorithms. Practical realisations of active systems. Active control of vibrations, transducers for active control.	urces. Active co
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enclosures, acoustic cou XP02DP Classification of electric c	pling, modes, local control. Feedback and feedforward strategy, analog adn digital realisations, algorithms based on LMS, stability of algo algorithms. Practical realisations of active systems. Active control of vibrations, transducers for active control. Electric Discharges and their Applications discharges. Townsend?s theory. Glow discharge. Processes on the surface of electrodes. Technological applications. Plasma displays. H	rces. Active co prithms, multich K
enclosures, acoustic cou XP02DP Classification of electric c	pling, modes, local control. Feedback and feedforward strategy, analog adn digital realisations, algorithms based on LMS, stability of algo algorithms. Practical realisations of active systems. Active control of vibrations, transducers for active control. Electric Discharges and their Applications discharges. Townsend?s theory. Glow discharge. Processes on the surface of electrodes. Technological applications. Plasma displays. H rc. Corona. Spark discharge. Lightning. Ball lightning. Z-pinch and its properties. Electromagnetic collapse. X-ray sources, controlled fusi	rces. Active co prithms, multich K
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VD00UZ	dealing with the given issue.		
XP02UZ	Ultrasound and Quantum Acoustics	ZK	4
	e lectures is to familiarize doctoral students with the issues of ultrasonic waves needed for the design of a wide range of ultrasonic de		uss in deta
	parts that the doctoral student could use in his work. The subject of the offer is a range of classic and recently developed findings fro		1
XP02VNP	Plasma Waves and Instabilities	Z,ZK	4
	nena will be introduced in the first part of the lecture (dispersion relation, phase and group velocities, Fourier analysis). Fundamental		
will be derived from	the linearized MHD equations (magnetoacoustic waves - Alfven, F and S wave; electromagnetic waves in plasma - O, X, R, L wave, part of the lecture will be devoted to final size waves, nonlinear phenomena (Landau damping) and solitons in plasma.	CMA diagram).	The second
		71/	4
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
	ave equation, plane wave, polarization, reflection and refraction, natural and artificial anisotropy, optical modulators, coherence, interferer rating, holography, methods of visualization, normal and anomalous dispersion, optical image formation, optical devices, photometry, stimulated emission, lasers.		
XP02ZFP	Fundamentals of the Plasma Physics	ZK	4
1	ovide you with a basic knowledge of plasma physics and of its applications. Plasma definition. Main plasma characteristics. Collisions		· ·
·	model Magneto-hydrodynamics. Aplications.	0 1	
XP04A1	English language 1	NIC	
	general English from previous studies, further develops speaking skills, listening and recalling spoken English as well as note-taking s	-	sic scientif
	terminology (cause-effect relationship, definitions, classification, basic information on composing written documents ).		
XP04A1ZK	English language 1	ZK	0
The subject A1 ZK i	s only for those postgraduate students studying in older study program valid up to Sept.2003 and did not ask for studying languages	according to the	newer stud
	program .		1
XP04A2	English language 2	NIC	I j
	ng written documents (papers, reports, articles, dissertations, official letters ); oral presentations, reading skills (getting both general a		,,
art of understandi	ng speech in a foreign language ; selected parts of difficult grammar; selected items focused on practical skills (reading mathematica	I symbols and ex	pressions,
XD04400714	writing CV). Oral presentations.		
XP04A2SZK	English Language	ZK	0
XP04A2ZK	English language 2	ZK	0
	ct is only for those postgraduate students who study in older program valid up to Sept.2003 and did not ask for studying the new lang		-
XP04AZK	English Language http://www.fel.cvut.cz/anketa/aktualni/courses/XP04AZK	ZK	0
XP04C1ZK	Czech language 1	ZK	0
XP04C2ZK	Czech language 2	ZK	0
XP04F1	French language 1	NIC	
	grammar and vocabulary, with the emphasis on technical style ; ability to understand technical texts on an intermediate level ( tested		60 pages o
	xts). Oral presentations - ability to talk on subjects studied by the postgraduate student. Writing cover letters , CV, answering advertis		
XP04F1ZK	French language 1	ZK	0
XP04F2	French language 2	NIC	
	icy both in grammar and lexical issues with emphasis on what is typical for technical style. Ability to be oriented in a more difficult tex		
	s). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by postgra skills related to job applications, cover letters etc.		
	s). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, (both language and content level studied by postgra		
exts (cca 120 pages	s). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by postgra skills related to job applications, cover letters etc.	aduates). Masteri	ng languag
XP04F2ZK XP04MIN	b). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by postgra skills related to job applications, cover letters etc. French language 2	aduates). Masteri ZK ZK	ng languag 0 0
XP04F2ZK XP04F2ZK XP04MIN English exam in form As part of the subse	b). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by postgraskills related to job applications, cover letters etc. French language 2 n of defense of professional study in English. The task of the doctoral student before the committee to defend his professional work draf quent 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.	aduates). Masteri ZK ZK fted and presente quickly and corre	ng languag 0 0 d in Englisl
XP04F2ZK XP04F2ZK XP04MIN English exam in form As part of the subse XP04N1	b). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by postgraskills related to job applications, cover letters etc. French language 2 n of defense of professional study in English. The task of the doctoral student before the committee to defend his professional work draf quent 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. German language 1	Aduates). Masteri ZK ZK fted and presente quickly and corre NIC	ng languag 0 d in Englisi ctly respor
XP04F2ZK XP04F2ZK XP04MIN English exam in form As part of the subse XP04N1 Extending skills with	i). Oral presentations, i.e. ability to talk about problems on a sufficiently good level, ( both language and content level studied by postgraskills related to job applications, cover letters etc. French language 2 In of defense of professional study in English. The task of the doctoral student before the committee to defend his professional work draf quent 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. German language 1 the emphasis on professional language. Listening to authentic technical texts from areas of electrical engineering , eliciting basic infor	Aduates). Masteri ZK ZK fted and presente quickly and corre NIC mation from the t	ng languag 0 d in Englis actly respor
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XP04R2ZK	Russian language 2	ZK	0
XP04S1	Spanish language 1	NIC	0
Increasing active ki	nowledge of Spanish language, including the language for specific purposes. Specific technical style characteristics focused on specific	c grammar and lex	is.Listening
	comprehension, oral presentations, understanding the text-all based on intermediate level language.		
XP04S1ZK	Spanish language 1	ZK	0
XP04S2	Spanish language 2	NIC	0
	ills(listening,understanding a Spanish text of cca 120 pages, writing, speaking). The skills are practiced on writing letters, presentation		
	vidual home preparation is necessary. Materials are chosen with regards to the study field of a postgraduate. High-level and fluent sp		
XP04S2ZK	Spanish language 2	ZK	0
XP04 1	Czech language 1	NIC	0
XP04 2	Czech language 2	NIC	0
XP12IMM	Engineering Methods in Mechanics	Z,ZK	4
Review methods so	lution of problems in rigid bodies mechanics, hydromechanical, thermodynamic and electromechanical systems. Dynamics of combine	d systems with usi	ng methods
	nalytical mechanics, assembling of mathematical model and resources for simulation. Identification of system parameters with respe-	-	ances and
	energy losses. Physical similarity and analogy, dimensional analysis, dimensionless parameters, PI-terms, fundamentals of experiment		
XP12VVM	Development and Research of Materials	Z,ZK	5
Research of corr	posite materials wth specific electrical properties. Diagnostics of materials in electrotechnology. Polymers. Phase transitions. Thin an	d thick conductive	layers on
	polymers. Organic solar cells. Models of function of biomaterials.		
XP13DFD	Data and Functional Analysis of Production Systems	Z,ZK	4
	em of production enterprise and its structure. Relationship of technological system to other systems. Tools of control and information of e		
	alysis of enterprise. Date base of technical preparation of production. Methodology of functional analysis of enterprise. Methods of da		-
methods of analys	is 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.	se of Petri nets for	analysis of
XP13FCD	Photovoltaics systems	Z,ZK	4
	er notovortates systems ses the most important problems of principle, technology of production and final use of photovoltaic systems for power generation. The	· .	
	version. Photovoltaic effect, photovoltaic cells. Optimization of cell structure in terms of optical and electrical properties of individual I		
	Determination of the maximum theoretically achievable energy conversion efficiency of a given structure. Photovoltaic modules. Technol		
	otovoltaic cells and modules. Characterization and diagnostic methods, analysis of failure types, influence on durability. Photovoltaic sys		
to the grid). Com	conents of photovoltaic systems. Simulation of yield for a given type of climate and season. Trends in applications of photovoltaic sys	ems and economic	c aspects.
XP13FDD	Physic of Dielectrics	Z,ZK	4
Types and mech	anizmus of polarization. Dielectric absorption. Electrical conductivity of insulators. Dielectrics in static electrical field. Dielectrics in tim	e-dependent electi	rical field.
Frequency disper	rsion of polymers. Thermal dispersion of polymers. Optical properties of dielectrics. Dielectrics losses. Electrical strength of insulators	. Electrical propert	ies of thin
	dielectrics films. Ageing of insulators. Properties of feroelectrics. Main and joined phenomena in dielectrics.		
XP13FPD	Semiconductor Physics	Z,ZK	4
The aim of the co	urse is to deepen the knowledge of the properties of semiconductor materials and structures that are important for a deeper underst	anding of the semi	conductor
	components technology .		
XP13MSD	Modelling and Simulation of Technological Systems	Z,ZK	4
-	mputer modelling and simulation. Programs processing port diagrams or block diagrams. Text edited systems and examples. Graphic		
- SIMULINK. Mode	ling of electric and electronic systems. Models of power semiconductor devices, modelling of power semiconductor systems. Example mechanical and electromechanical systems, hydraulic systems and thermal systems. Examples of simulations.	es of simulations. I	viodelling of
XP13PED		Z,ZK	4
	Plastics in Electrical Engineering in electrical manufacturing. Exercise plastics in the production of the cables, structural members etc. The specialty requirements on the	· .	
	dity, of shape constancy). Composite materials from out plastics. Technology treatment of plastics. Degradation of plastics impact of o		
-	chanic stability and chemical resistance). The plastic waste. Recycling of plastics. Impact of production and the used up plastics on the		
XP13PSD	Flexible Production Systems	Z,ZK	4
	s of automation. Flexible automation. Basic components of FMS. Machining centres, flexible manufacturing cells and islands. Option,		
Control of FMS ar	nd its components. Interfaces. Systems of automatical self checking of quality. CNC machines appropriate for FMS. Manipulators and	robots as the com	ponents of
FMS. Transport a	nd its control. CNC for the control of FMS. Flexible assembling systems. Automated plants of future, conception and tasks. Efficiency	of FMS. Personal	problems.
XP13SID	Software in Industrial Engineering	Z,ZK	4
Introduction to usin	g of IBM compatible personal computers, their architecture. Using of application programs for mathematics, graphics, text processing,	database and CAL	D, examples
	of software systems. Introduction to user interface based on Microsoft Windows.		
XP13SJD	Quality Control Systems	Z,ZK	4
	lity and reliability. Basic quality management systems. ISO 9000, TQM, Kaizen. Basic characteristics of ISO 9000. Quality manual. Q		
	ality. Mathematical model based on factor experiments. Optimization of mathematical model. Six Sigma quality management system		
tools of the Six	Sigma system. Reliability as a subset of quality. Mathematical distributions used in the field of reliability. Usage and maintenance coe	fficient. Backup - ty	pes and
	mathematical description. Accelerated reliability testing. Processing and analysis of experimental data.		
XP13SRD	Real Time Systems for Process Control	Z,ZK	4
Introduction to usin	g of real time control paradigm. Architecture of real time systems. State transition diagram of real time systems. Semaphore and deadle	оск. Using of real ti	me systems
	in control of technological systems.		
XP13SSD	Special Methods of Devices Quality Evaluation	Z,ZK	4
	the principal values determining the quality of the passive and active devices. Measuring methods, their evaluation, identification of systematic provide the device to the measuring circuit. The poise of the electronic circuits, optimal		
	vice, two ports parameters of the device. Matching of the device to the measuring circuit. The noise of the electronic circuits, optimal Non-linearity of the "linear" circuits, intermodulation distortion, measuring of the non-linearity and intermodulations.	noise and power m	atorilliy.
XP13TMD	Technological Aspects of Microcomputer Design	Z,ZK	4
	nputers, modular design and hardware solution. The data storage technology. The data storage media. The device protection against	·	
	condition of equipments. The human machine interface - input and output devices. The ergonomic design of microcomputers and spe		
e e	stems, criteria. The quality control of design and services, the quality of software. The legal aspects of microcomputer use. The control of design and services are specified as the second service and second services are specified as the second service as the second ser		
	microcomputers.	,	
XP13TND	Technology of Low Temperatures and Superconductivity	Z,ZK	4
I nermodynamic p	principles of cooling. Equipments for achievement of low temperatures, liquifiing of gases. Ultralow temperatures. Properties of isotop-	es of He and select	ted gases.

phenomena. Proper	and work in low temperature laboratory. The use of low temperature technology in practice.	ture mermometry.	
XP13TPD	Technological Processes in Electronic Manufacturing	Z,ZK	4
Development of tec	hnology of packaging. Contemporary methods of packaging of components SOP, DIP, SIP, ZIP, QFP and others, properties, advantage	es,disadvantages.	Comparison
	he viewpoint of environmental resistivity. Classification of multichip modules. Multichip modules of different types: MCM-L, MCM-C, N		
multichip modules	Technology of contacting og dies. Electrical design of MCMs. Thermal design of MCMs. Physical design of MCMs. Parameters for er of MCMs. Design tools. Programmable modules. Applications of MCMs.	aluation of MCM	s. Reliability
XP13VTK	Vacuum technology and cryogenics	Z,ZK	4
	iminous processes. Surface processes. Processes circulative to wall. Vacuum pumps. Measurements in vacuum techniques. Principle		-
	s for achievement of low temperatures. Properties and behavior of matters at low temperatures. Transport of heat and insulating syst	-	
temperature ther	mometry.Laboratory training and seminars are focused to obtain a basic practical proficiencies and the other knowledges in vacuum	technology and c	ryogenics.
XP14APR	New Trends in Electric Device Apply	ZK	3
XP14DES	Dynamics of Electric Machines	ZK	4
	play an important role in a number of areas, such as e-mobility, renewable energy sources utilization, robotics and automation. The n	-	
-	ents with deep understanding of the principles, operation, and analysis of rotating electric machinery. Mathematical models based or loped for various types of electric machines (induction machines, electrically excited synchronous machines, permanent magnet sync		-
	electrical machine theory on such a level is necessary, for instance, for design of modern control methods of electric drives or const		
XP14EMC	Electromagnetic Compatibility	ZK	4
	ces. Interference coupling. Shielding. Earthing. Nonlinear consumers. Harmonics in electric convertors in steady and transient condit		1
	converor influences on the network. Compensation and filtration.		
XP14MEN	New Trends in Converter Technology	ZK	4
	dy is to introduce students to the principles and functions of latest topologies of power semiconductor electric energy converters, tak	-	
	intent of the subject is the optimization of the power conversion parameters in power semiconductor converter systems. The subject is		
	inciples, topologies, functions and possibilities of application of power semiconductor converters realized on the basis of modern pow powerful control microcomputers. The topics are focused on pulse width modulation methods for voltage and current control, modes (		
	, active control of the current curve and the voltage curve, as well as the overall quality of electric energy transmission. The problems	-	
	matrix converters, multi-level converters, resonant converters as well as problems related to their practical use are also solve	ed.	
XP14MIR	Microprocessor Control of Electric Drives	ZK	3
	digital signal processor (DSP), digital signal microcontroller (DSC), architecture, computational resources, fixed point, fraction, float		-
	bller, special blocks, ADC, event memory, FIFO, CAM, Multiport RAM, impulse signal generation, serial communication, methods, bus		
multiprocessor sy	stems, parallel processing, RT systems, solution methods, systems: INT, BG-FG, FSA, CC, preemptive RTOS, tasks, queues, semag computer programming methods, control computer resources application in scalar and vector control of electric drives.	nors, critical sect	ion, control
XP14MRP	Advanced Controlled Drives	ZK	3
XP14MZR	New Control Methods for Electric Drives	ZK	4
	se is to introduce students to the latest issues of control and regulation of electric drives, taking into account the focus of their doctoral		1 .
			•
electromechanical	energy conversion parameters in electric drive systems and relevant power electronics, in particular by using modern control and reg	ulation algorithms	s. The course
	is mainly focused on electric AC drives, especially drives with asynchronous and synchronous motors.	_	s. The course
XP14TPR	is mainly focused on electric AC drives, especially drives with asynchronous and synchronous motors. New Trends in Electric Device Theory	ZK	3
XP14TPR XP15DVN	is mainly focused on electric AC drives, especially drives with asynchronous and synchronous motors. New Trends in Electric Device Theory Diagnostics of HV and EHV Insulating Systems	ZK Z,ZK	3
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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. Z,ZK XP15RE Control of Power Systems 4 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 Z.ZK 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 7.7K 4 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** Electric Energy Use and Conservation Z,ZK 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 Light sources and Equipment Z.ZK 4 XP16DEL 2 History of technology and economic ΖK XP16EKO Economics ΖK 4 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 XP16EME Economics and Management of Energetics ZK 4 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. XP16ERU Accounting ΖK 4 Principles of accounting. International accounting standards (IFRS). Methodology of accounting. Cost, revenues, profit and cash flow. Balance sheet, profit and loss account. Analysis of company's financial position. XP16FIM **Financial Management** ZK 4 Principles of finance, 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 finance, cash flow finance. XP16FVT Philosophical Problems of Science and Technology 7K 2 The course is engaged in the evolution of principal ideas on which the science and technology are founded. Philosophical aspects of physics and mathematics are deeper examined. Actual themes linked to the so called "Postmodernism" and to the alternative ways of understanding and their social coherences are discussed. XP16JAK 4 **Quality Management** 7K Quality assurance in the organization. Statistical methods in quality management. Models of quality systems. Economic issues in quality assurance. Implementation of requirements of ISO 9001 standard. Certification of products and production systems. Recommendations for quality management in the organization. XP16KVM Quantitative Research Methods in Management 7K 4 Application of software SPSS for advanced statistical methods as multiple regression and correlation, analysis of variance, factor analysis, cluster analysis and its using in marketing research and management. XP16MAN Management ΖK 4 Principles of management and its innovation, modern ways of management, responsibility of managers, manager's ethics, successful manager thinking and behaviour XP16MAR Marketing 7K 4 The role and functions of the marketing management. Marketing research and marketing information system. Concepts of marketing strategy. The use of product life cycle and portfolio. Product and service policy, pricing and contractation policy, communication, distribution. Marketing mix. XP16MAS Marketing Strategies ΖK 4 Broadening of basic knowledge of marketing. The analysis of marketing strategies in different market situations. The firm's behavior under competition and competitive advantage Case studies in the field of product policy, price and condition policy, communication policy and distribution policy. XP16MAU Accounting for management 7K 4 The principles of managerial accounting. Relations to the organisational structure of the enterprise and to the production process. Budgets, use for management. Calculations and cost analyses. Productivity and measurement of productivity in the production process. The managerial information systems XP16MAV **Production Management** ΖK 4 The role of production process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning with respect to production typology Standardized basis of production management, standardization. Controlling, production management methods. XP16MES Economics and Management of Energy Systems ΖK 4 Strategic questions of electric power sector, gas systems and central heating systems functions. Marginal revenue in electric power system. Marginal costs of electricity, heat and gas. Power elements optimization, subsystem and system optimization in generation and transportation of different kinds of energy. Reliability in energy delivery. International cooperation in power industry. Energy price regulation and its consequences XP16MEU Economics and Management of Energetics 4 7K 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. XP16MVE Selected Problems of Economy and Management of Energy ZK 4 The role of production process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning with respect to production typology. Standardized basis of production management, standardization. Controlling, production management methods.

XP16STM	Selected Statistical Methods	ZK	4
	cs. Transformation of random variables. Aproximation of theoretical distributions. Interval estimates. Hypothesis testing. Simple and multip	le regression. Ana	lysis of time
	series.Index number.		
XP16STV	Product Strategy	ZK	4
Product and se	ervice policy, pricing and contractation policy, communication, distribution. Marketing mix. Inovations. Concepts of marketing strategy. R	everse marketing.	Product
	management. The strategic marketing simulation Markstrat.		
XP17ANS	Selected Chapters from Antennas and Propagation	ZK	4
	nnas and modern antenna technology. Selected problems of antennas and propagation for fixed and mobile communication, earth and		
management fo	r different services and communication. Topics of near a far field antenna measurement, compact antenna measurement. Measureme	nt of signal level fo	r specific
	services. Antenna anechoic chambers design.		
XP17APL	Applied Optoelectronics in Medicine	ZK	4
	s of non-invasive measurement techniques in medical diagnostics. Fundamental physiology of the vascular system, hemodynamics, si		
Computer simulat	ion of the cardiovascular system. UV, VIS and IR spectroscopy. Fundamental optics of the eye and color analysis. Optical parameters of the sector of the sec	•	. Dispersion
	of light, Design of optical sensors, Optical visualisation principles of translumiscetion and tomography, Optoelectronic systems in m		
XP17ELD	Electrodynamics	ZK	4
XP17LAE	Medical Applications of Electromagnetic Field	ZK	4
	ies of EM Field medical applications. Principals and technical equipment for EM thermotherapy, hyperthermia applicators. Calculation		
distribution. De	tails of microwave thermotherapy apparatus are given, especially from the point of view of applicators for local, intracavitary and region	hal treatment. Non	-invasive
XP17MAPP	thermometry (NMR, ultrasound and radiometry) and special compatible applicators are described.	ZK	4
	Analysis Methods for Passive Elements of Microwave and Millimeter-wave Technique ansmission lines parameters. Computation of microwave circuits scattering parameters, analysis of planar antennas. Survey of basic m	1	4
	estress on methods: spectral domain, integration equation, finite differences, finite elements, mode matching, transversal resonance. S		-
	electromagnetic fields, moment method, disturbance method.		
XP17MT	Microwave Technique	ZK	4
	nission lines and its circuit elements including hybrid and monolithic integrated circuits technology. Resonators and other type of passi	1	1
	plers, isolators and circulators, modulators etc.) and active microwave circuits (e.g. oscillators, mixers and amplifiers), microwave filters		
,	CAD of microwave circuits.	-,	
XP17MVP	Methodology of Science	ZK	
XP17NME	Numerical Methods in Electromagnetic Field	ZK	4
	moholtz and wave equations. Analytical, semianalytical, seminumerical and numerical methods. Matrix equations and algorithms: Mod		
	Method of Moments, Multiple MultiPoles, Boundary Element Method, Finite Difference Method, Finite Element Method, Finite Integration	•	
	of matrix equations: direct methods, Gauss-JordanOs elimination, pivotation, LU-decomposition, banded and sparse matrix, conjugation		
XP17OV	Optical Fibers	ZK	4
	optical fibers, attenuation and dispersion, step-index fibers, gradient fibers, single and f1ibers, optical cables, splices and connectors, o		urements,
	fabrication, nonlinear phenomena in optical, fibers, fibers for sensors.		
XP17TAM	Evaluation of Applicators for Microwave Thermotherapy	ZK	4
Lectures are focu	ssed on methodology of evaluation of microwave applicators, which means measurements of SAR distribution in water phantom and n	neasurements of the	emperature
distribution in var	ious types of agar phantoms. Further design and optimisation of measuring probes is discussed, methodology of probes calibration a	nd measured data	evaluation
are	described. Numerical modelling of microwave applicators by aid of software product FEMLAB, comparison of mathematical and exper	imental models.	
XP17TVC	Technique of Highly Sensitive Receivers	ZK	4
	ly sensitive microwave receivers, mm - wave and submm - wave receivers. Electromagnetic spectrum and noise properties of the Earth	-	
	etre wave communication. Semiconductors for microwave and millimetre wave bands, SIS detectors, mixers, infrared receivers. High frequencies of the second		technology,
	surement of noise parameters. Multispectral radiometry and remote sensing, electromagnetic radiation - interference, EMC theory and		
XP31AEO	Electric Circuit Analysis	ZK	4
	i devices and structures. Methods of analysis and algorithms for linearized circuit models in time domain and frequency domain. Transi		
state analysis.	Analysis of nonlinear circuits in time and frequency domains. Parametric models. Circuits with non-linear energy storing elements. Circ professional software packages.	uit analysis with th	ie neip oi
	professional software packages.		
XP31ART	Architectures for Deal Time Implementation	71/	-
	Architectures for Real Time Implementation	ZK	4
	entral processing units and synthesis of data paths for DSP. Implementation strategies of DSP algorithms. Influence of algorithm modif	fication on the impl	4 lementation
processing time.	entral processing units and synthesis of data paths for DSP. Implementation strategies of DSP algorithms. Influence of algorithm modif Sequential and parallel processing. Numerical characteristics of algorithms. Implementation alternatives, dedicated hardware and prog	fication on the impl grammable signal p	4 lementation processors.
processing time.	entral processing units and synthesis of data paths for DSP. Implementation strategies of DSP algorithms. Influence of algorithm modif Sequential and parallel processing. Numerical characteristics of algorithms. Implementation alternatives, dedicated hardware and prog gital signal processors with fixed point and floating points. Developments tools for real time processing. Analysis of real time implemen	fication on the impl grammable signal p	4 lementation processors.
processing time. Architectures of di	entral processing units and synthesis of data paths for DSP. Implementation strategies of DSP algorithms. Influence of algorithm modif Sequential and parallel processing. Numerical characteristics of algorithms. Implementation alternatives, dedicated hardware and prog gital signal processors with fixed point and floating points. Developments tools for real time processing. Analysis of real time implement special algorithms for communications.	fication on the impl grammable signal p tation of FFT, digita	4 lementation processors. al filters and
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Architectures of di XP31ASN Information about	entral processing units and synthesis of data paths for DSP. Implementation strategies of DSP algorithms. Influence of algorithm modif Sequential and parallel processing. Numerical characteristics of algorithms. Implementation alternatives, dedicated hardware and prog gital signal processors with fixed point and floating points. Developments tools for real time processing. Analysis of real time implement special algorithms for communications.	fication on the impl grammable signal p tation of FFT, digita ZK 2. The lectures are	4 lementation processors. al filters and 4 devoted to
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	cond part is devoted to linear analog systems, their characteristics, description and synthesis capabilities. There are discussed: the type		
	nods of filter synthesis and their optimization with regard to real properties and value variances of the circuit elements, implementatio s, i.e. switched capacitor (SC) and switched-current (SI) circuits. The last part deals with computer-aided circuit design. The principles		-
	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
	formations - Laplace and Z-transforms, Fourier transform, cepstra, wavelet transforms. Signal parameterization - AR, MA, ARMA mo		
	classification - spectral distances, Markov models, neural nets, signal prediction.		Ū
XP31ZBS	Biological Signal Processing	ZK	4
The course deals w	ith the processing of biosignals and advanced methods of processing resulting from current research in solving common projects in co	poperation with top	institutions
(medic	al faculties, institutes of the ASCR, foreign universities). The subject concept allows us to respond flexibly to new directions and know	ledge in the field.	
XP32AKR	Applied Cryptography	ZK	4
	yptography.Mathematics Foundations of Cryptography.Related Problems of Number Theory.Public Key Parameters. Pseudorandom E	-	
Cipners. Block Cipr	ers.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.	nt Protocols.Key N	lanagement
XP32DZS		ZK	4
	Digital Signal Processing in Telecommunications	ZK	4
XP32MOS	Mobile Networks zes students with evolution and standardization of mobile networks and mainly provides a detailed description of network architectures a		4 ic principles
	used in mobile networks. The course as well depicts trends and the future development of mobile networks.		ic principles
XP32NMR	Numerical Methodes of Electromagnetic Tasks Solution	ZK	4
	ith analysis of electromagnetic field distribution through both air and other environment. It offers a view deep inside to popular numerica		-
-	Element Method and Finite Element Method. Handling the software is obvious nowadays; nevertheless, the mayor attention is paid to un		
	background of the used apparatus and understanding the physical principles of the solved tasks in symbiosis to particular used so	oftware.	
XP32RTS	Telecommunications Systems Management	ZK	4
Telecommunicatior	s Systems Management is a discipline which deals problems of interactions of technical and business aspects of management of tele	communication n	etworks and
	services provided.		
XP32TPZ	Teletraffic Theory	ZK	4
	se is to present an overlook of dimensioning of telecommunications networks on the basis of results of the queuing theory (QT). Introc		
-	etworks both from the point of view of grade of service GoS and quality of service QoS as well. Results of the QT are applied on diffe		
	networks deploying and operating at time being. Theoretical knowledge about models of service systems can be utilized for dimensionir in real life - not only in the telecommunication.	ng of different serv	ice systems
XP33BID	Bionics	ZK	4
	boy + technology = bionics. Bionics Classification. An overview of biological principles and its technological parallels: reproduction, gr		
	on, excrementation, thermoregulation, vision, hearing, taste, smell, sense of touch, speech, memory. Neural and neuronal systems. N		-
-	cs. Information transfer in biotechnological systems. Biosystems modelling. Biosystems diagnostics. Orientation and navigation. Func		
external substitutes	, bioprotheses. Artificial organs and its control. Intelligent interaction and communication in biotechnical systems. Intelligent input and	output filters. Sup	port system
	for creative thinking.		
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 planning		
	Communication strategies, message passing. Various AI approaches, case studies. Types of agent behavior. Negotiation. Organization	-	-
	poard systems. Client-server systems. Peer-to-peer systems. Implementation aspects of distributed knowledge-based systems. Learn eta-agent. Agents acquitance models, social knowledge, reflectivity in MAS. Coalition formation, team work. Formal models of agent a		
XP33ECD	Evolutionary Computing	architecture.	systems.
		71/	
		ZK	4
	utionary computing in contrast to classical computing techniques, Genetic algorithms (GA) for optimisation. The Simple Genetic Algor egative phenomena, GA and constrained tasks, special representations, Genetic Programming (GP), relationship to GA, GP typical tas	ithm (SGA) and it	4 s behaviour.
	egative phenomena. GA and constrained tasks, special representations. Genetic algorithms (GA) for optimisation. The Simple Genetic Algorithms egative phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typical tas GA and GP applications. Special methods for improving GA performance.	ithm (SGA) and it	4 s behaviour.
XP33FLO	egative phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typical tas GA and GP applications. Special methods for improving GA performance.	ithm (SGA) and it: sks, GP and machi	4 s behaviour.
XP33FLO	egative phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typical tas	ithm (SGA) and it	4 s behaviour. ne learning.
XP33FLO XP33GAD	egative phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typical tas GA and GP applications. Special methods for improving GA performance. Fuzzy Logic	ithm (SGA) and it: sks, GP and machi	4 s behaviour. ne learning.
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XP33GAD Algebraic structur	egative phenomena. GA and constrained tasks, special representations. Genetic Programming (GP), relationship to GA. GP typical tas GA and GP applications. Special methods for improving GA performance. Fuzzy Logic Basics of fuzzy sets and fuzzy logic. Measures on collections of fuzzy sets. Principles of fuzzy control. Geometrical Algebras es used in geometry: Groups and linear spaces, ordered groups and fields, othogonal groups, Clifford algebras, etc. Discussion of por processing.	ithm (SGA) and it: sks, GP and machi ZK ZK	4 s behaviour. ne learning. 4 4
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XP33NUM	Numerical Analysis	Z,ZK	4
	ces to basic numerical methods of interpolation and approximation of functions, numerical differentiation and integration, solution of tr		-
partial) differentia	al equations and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demonstra	tion of their prope	erties using
	Maple and computer graphics.		
XP33PAD	Probabilistic Algorithms	ZK	2
	notions of statistic and probability. An analysis of the notion of non-deterministic algorithm. Effectivity criteria for non-deterministic algorithms. Criteria for analysis of the avanted risk. Prehability and visit of deterministic algorithms. Criteria for analysis of a complexity of the avanted risk.		
	orithms. The probability of failure. Loss function. The expected risk. Probabilistic analysis of deterministic algorithms. Criteria for applica Probabilistic algorithms and their practical importance.	lion of probabilisti	c algorithms.
		ZK	4
XP33PAM	Industrial application of multi-agent systems		4
XP33PMD	Probabilistic Models of Uncertainty in Al	ZK	4
	obability. 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		
Lemma, Diock ind	models and Bayesain networks. Decomposable models for computation in Graphical Markov models. Examples of application		
XP33PPD	Practical Data Mining Problems	ZK	4
	sed on solving of practical data mining problems. Lectures deal with data transformation, pre-processing and verification, selection of a		
	process evaluation and results interpretation. The attention is paid to solving of an individual data mining problem based on real-life d		
	lecturer.		
XP33PUD	Artificial Intelligence	ZK	4
Natural language	communication with a computer, phases of processing, syntactic analysis, grammars including DCG. Understanding a sentence, ser	antic support of a	analysis and
efficient memory of	rganization. Knowledge engineering and knowledge elicitation. Machine learning -review of methods and tools. PAC learning. Learning	in 1st order logic,	ILP. Planning
	and scheduling.		
XP33RMD	Control of Mobile Robots	ZK	4
	tt Mobile Robots. Known Control Architectures. Top-Down and Bottom-Up Approaches. Overview and Comparison. Distributed Autonom		•
	ghbourhood Mapping. Needed Sensors. Ground of Ethology. Imprinting. Taxe. Stimuli, Receptors. Multiple Motivated Behaviour. React		
-	nunity Robots Structure. Task- or Behaviour-Oriented Robots. Ways and Realisation of Robots Co-operation, Motivation, Observation	-	
	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		
XP33ROD	Pattern Recognition	ZK	4
VD00D07	See https://cw.fel.cvut.cz/wiki/courses/xp33rod/start	71/	
XP33ROZ	Selected Topics in Pattern Recognition	ZK	4
	sic course in pattern recognition (e.g. P33ROD, 33RPZ). Selected topics: Anderson's problem, Kozince algorithm, kernel perceptron, r g theorz. Deterministic learning. Unsupervised learning: Robbins algorithm and emprirical Bayesian approach. Expectation-minimizati		
vapriik s learning	sequences and directed acyclic graphs. Markov models. Combination of weak classifiers: boosting and bagging. AdaBoost	-	ognition of
XP33RSK		ZK	4
	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		1
	ds which are robust have been developed. It means that these methods are not so sensitive to small deviations from an underlying m		
1	cept of estimation and then we introduce the robust approach, some basic robust estimators of location (e.g. trimmed mean, Hampel		
	robustness (influence function, breakdown point).	,	
XP33SCD	Man-Machine Systems	ZK	4
	chine systems development. Human operator tasks. Manual control, supervisory control cognitive control. Typical structure of a control s	ystem. Distributio	n of priorities
in control between	operator and machine. Control levels after Rasmussen. Skill based, role based and knowledge based operator behavior models. Fuz	zy models. Cogn	itive models.
Operator psycholog	gy. Mental models. Human-machine interaction. Intelligent interface. Factors influencing operator behavior. Stress. Mental load. Human	error detection.	/lan-machine
	system reliability. Man-machine systems simulators. User-centered system design.		
XP33TTM	Text mining	ZK	4
XP33UID	Artificial Intelligence	ZK	4
s	al issues. Knowledge representation: production systems, predicate logics, semantic nets, frames, and scenarios. Problem solving, sta	•	
	of the search algorithms. Expert systems for diagnostics and planning tasks. Uncertainty processing. Hajek's algebraic theory. Creation of	-	s. Knowledge
	sition, induction from examples. Distributed expert systems with the blackboard architecture, multi-agent systems. Backgrounds of pa		1
XP33VID	3D Computer Vision	ZK	4
	rspective 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 de	-	-
	reconstruction from stereovision, error propagation, examples. Physics of image reflection, image irradiance equation, basic reflectan shading problem. Local shading analysis. Overview of other Shape-from-X methods. Up-to-date info at https://cw.felk.cvut.cz/doku.ph		-
XP33ZPM	יות איז	ZK	1
			4
XP33ZVD	Introduction to Computer Vision	ZK	4
VD044DD	The subject does not exist anymore. Its last lecture run in the academic year 2021/2022.	71/	4
XP34APD	Advanced Power Semiconductor Devices and ICs	ZK	4 dos Bipolar
-	nological structures. Development trends. Parameters and applications. Bipolar structures. MOS structures. BiMOS structures. PN dio nd IGBT transistors. Thyristors (including GTO and MCT). Secondary breakdown, mechanism, safe area. Smart-power devices. High vol	-	
	applications	age ios, operation	, אסולוטווויזא,
XP34AT	TCAD Tools Applications	ZK	4
	he computer-aided technological design. Device simulators Atlas and Sentaurus: principle, applications. Basic equations. Boundary of		1
	ation models. Avalanche ionisation models. Mobility models. Hands-on exercises on SUN workstations according to the tasks of stude		
XP34CNO	Integrated Optics	ZK	4
	hnological principles of IO Basic materials for IO. Light propagation in waveguide structures. Methods of waveguide structure design. P		1
	ule structures. Modal spectroscopy. Fundamental physical effects and interactions for IO. Preparation of dielectric waveguides and str	-	
	s. Electro-optical modulators. Applicable measurement methods. Devices based on nonlinear effects. Semiconductor integrated opto-		-
XP34ETS	Electrical Transport in Semiconductors	ZK	4
	ransport in semiconductor crystals. Effective mass, mobility Boltzmann's transport equation. Scatter mechanisms, frequency. Scattering		1
velocity saturation	on. Relaxation time approximation Carrier transport in a strong electric field, velocity saturation. Carrier transport in magnetic field. Ca	rrier transport in r	nanometre

	blockade. Ballistic transport. Quantum Hall's effect. Simulation of transport effects.		
XP34IO	Integrated Optics	ZK	4
Light propagation in wa	veguide structures. Methods of waveguide structure design. Waveguide coupling elements. Gratings structures at waveguides. F	undamental phys	sical effects
and interactions for IO.	Design and preparation of dielectric and polymer waveguides and structures. Optical waveguide gratings. Passive waveguide structures	ructures. Electro-	absorption,
-	rmo-optical effects and their use for IO. Structures for control of optical radiation Devices based on nonlinear effects. Semicond	-	
optical amplifiers. Optica	I components for informatics and sensors, multiplexing and optical processing. Applicable measurement methods, principles of r	nanophotonics ar	nd integrated
	optics application.		
XP34MSY	Microsystems	ZK	4
-	Ind classification of microsystems. Micro-sensors. Micro-actuators. Signal processing within the system. MEMS (micro-electrical-mathematical actual data and a signal data and a signa		
(micro-optical-electrica	al structures). MEMOS (micro-electrical-mechanical-optical structures). Microsystem design. Microsystem modelling. Manufacturi Industrial applications. Medical applications.	ing technologies.	materials.
XP34ORD	Optical Radiation Detection and Detectors	ZK	4
	netic radiation, radiometric and photometric units. Detection of optical radiation. Ideal detectors, internal and external photo-effect. E		-
	al photo-effect detectors, PN junction. PIN photodiode, physical principles, properties. Avalanche photodiode, physical principles,		
	erties. Thermal energy conversion detectors. Bolometers, thermocouples. Pyroelectric detectors. Some other detector types. Optica		
	properties, noise. Solar cells, properties. Measurement methods, applications.		
XP34PED	Advanced Electronic Devices	ZK	4
Energy band engineering	g. Quantum well, wire, point. 2D electron gas based devices (HEMT, MOD FET). Devices based on resonance double-barrier tunne	elling. 3D structur	es. Quantum
device applications (me	emories, generators, multipliers). Heterogeneous structures. Microwave devices, HBT, Gunn diodes. Microwave device applicatio	ns. Heterogeneo	us devices
	with internal optical coupling. Cryotronic devices. Recording media. IC development trends.		
XP34PIC	Programmable IC Design	ZK	4
	s to acquaint students with advanced methods of design, synthesis and verification of programmable systems and systems with	s s	
	asic building elements, architecture and design procedures used to implement complex integrated systems, methods of describir I verification strategy, design and analysis of tests. This project-oriented course would with the use of state-of-the-art EDA tools to	•	
Synthesis. They will learn	programmable integrated system whose application would be linked to the topic of the dissertation.		nprenensive
XP34SRS	Semiconductor Radiation Sources	ZK	4
	n semiconductors. Homogeneous and heterogeneous junction, double heterostructure lasers and LEDs. Non-coherent LED's, su		1
Electromagnetic fields	in semiconductor lasers. Types of lasers and their properties. Waveguide lasers, DFB and BFR structures. SQW and MQW lase	ers, quantum well	s. Tunable
injection lasers. Spectral I	line width and line stability. Radiating characteristic, coupling of the radiation source to a waveguide. Bi-stable and memory elements	and switches. Se	miconductor
injection,	waveguide amplifiers and wave convertors. Lasers and non-coherent diodes for optical communications. Measurement methods	, applications.	1
XP34STV	VLSI Structures and Technologies	ZK	4
	the IC's. Bipolar and unipolar structures. BiCMOS structures. 3D structures. Sub-micron structures. Memory structures. Testing s		echnological
	Advanced semiconductor technology. IC design, design of technology. Design rules. Reliability, yield. Outlooks and limitations of		
XP34TOS	Technology of Optical Devices ronic materials and structures. Diagnostic and testing methods. Design and preparation of double heterostructures. Preparation of	ZK	4
Freparation of optoelectr			
			-
Preparation of LED's,	lasers, photo-resistors. Preparation of QW structures. Design of dielectric waveguide structures. Preparation of dielectric waveguide structures.	uide structures. D	esign and
Preparation of LED's,		uide structures. D	esign and
Preparation of LED's,	lasers, photo-resistors. Preparation of QW structures. Design of dielectric waveguide structures. Preparation of dielectric waveguide iation distributing structures. Design and preparation of optical radiation control structures. Measurement methods. Testing methods	uide structures. D	esign and
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XP35RRD	Robust Control	ZK	4
XP36ASP	Advanced course on selected topics in robust control. Architecture of Symbolic Computers	ZK	4
	ns and abstract programs, lambda calculus, formal basis for abstract programming, self-interpretation, SECD abstract machine, memory		
evaluation, Lisp imp	plementations, predicate logic and its inference engine, Prolog inference engine and dynamic algebras, Warren abstract machine, optimis parallel inference engines.	ation, Prolog imple	ementations,
XP36DRO	Diagnostics and Reconfiguration of Programmable Circuits is aimed to help PhD students to understand better methods of reliability and availability improvement of SOC and NOC circuits built	ZK	4 SICs
XP36DSY	Distributed Systems	ZK	4
Communication m	echanisms - message exchange, procedural communication (RPC, ORB), distributed shared memory. Process algebras - CSP, CCS	•	
	tets. Distributed execution, global state, causality, logical time. Algorithms of: exclusive access, leader election, deadlock detection/pre resiliency, qourum algorithms, replication. Mobility, search in distributed systems - DHT.		on. Faults,
XP36HS	Hypermedia Systems and Internet Computing	ZK wah Wah anging	4
Hypermedia system	ms, basic models. Intelligent searching, adaptive navigation, personalization of access to web applications. Web intelligence, semanti topics and the ways out. Internet computing. Modern technologies for web applications design.	c web. web engine	ering, main
XP36JAI	Languages for Artificial Intelligence	ZK	4
The course offe	rs a deep insight into the two programming languages that are most frequently used in the domain of artificial intelligence (Lisp, Prolo paradigms used to build typical AI algorithms and gives some basics concerning the implementation of the two languages		ramming
XP36KP	Communication Protocols	ZK	4
	btocol principles, SDL language, protocol architecture: ISO OSI, error control, data-link layer protocols: X.25, higher layer protocols (T		-
state machines,	implementation tools (FSM language ESTELLE, regular grammars), use of Petri nets, specification language LOTOS, protocol transfer validation and verification of protocols.	ormation, design,	synthesis,
XP36LSM	Logical Simulation	ZK	4
	n to simulation: fundamental ideas and principles of simulation systems, synchronous and asynchronous simulation. Simulation system		
of digital circuits: o	data types, entities, architectures, sequential environment (processes, functions, procedures), signals and their attributes, resolution f (data-flow description, blocks, structural description), configuration of structural models. Students who completed course 36SIM can		nvironment
XP36NSN	Neural Networks and Neurocomputers	ZK	4
	ound, paradigm classification and artificial neural networks learning methods. Student is supposed to propose and test the application		
for a partial issue c	concerning his dissertation theme during the semester. Procedure and results would be concluded in the preliminary publication form a scientific forum.	designed to be pre	sentable on
XP36PAS	Algebraic Specifications Prototyping	ZK	4
	fication, syntax and semantics of a specification language (OBJ3), structured specifications, generic specifications, implementation of Prolog, translation into Lisp, term rewriting systems, abstract rewriting machine, prototyping of a specification, prototyping in OBJ3, com		
interpretation using	(C++).		rananguaye
XP36POA	Advanced Parallel Algorithms	ZK	4
	rsis of time-, and cost-efficient PRAM algorithms and parallel algorithms for distributed memory machines. The collection of algorithms ithms, distributed list ranking, Cole's MergeSort, optimal mesh sort, connected components, tree contraction and tree evaluation, patt		-
XP36PSV	Parallel Systems and Algorithms	ZK	4
	asures and scalability of parallel algorithms. Parallel computer architectures, models, PRAM, APRAM. Direct and indirect interconnect		
	nunication algorithms - routing, switching techniques, deadlock problem, permutation routing, collective communication operations. Fu omputation, Euler tour technique. Parallel sorting. Parallel linear algebra algorithms. Parallel combinatorial search. Parallel complexity th		-
- reduction, prenx c	studies in specialization Computer Science and Informatics FEE CTU cannot register.	eory Graduates or	engineering
XP36RGM	Reading group in data mining and machine learning	ZK	4
	aims at revealing non-trivial, hidden and ultimately applicable knowledge in large data. Data size and data heterogeneity make two ke The main goal is to understand the patterns that drive the processes generating the data. Machine learning (ML) focuses at computer		
	igh experience and by the use of data. It often puts emphasis on performance that the algorithms reach. The distinction between DM a	•	
learning is often us	ed as a means of conducting useful data mining. For this reason, we cover both the areas in the same course. The main goal of the course are a set of the course of the co	ourse is to get acq	uainted with
XP36RSY	advanced and modern topics in the field. Reconfigurable Systems	ZK	4
	reconfigurability as a part of normal function. Technology of reconfiguration., partially reconfigurable devices. Reconfiguration control a		1
with operating system	ems, software support. Design and verification of reconfigurable systems, algorithms, EDA tools. Reconfiguration in System on Chip ( Seminars, experiments with reconfigurable devices, case study, literature research.	SoC). Codesign iss	sues in SoC.
XP36SEP	Seminars on Architectures of Parallel Computers	ZK	4
	tectures of high-performance computers and trends in technologies. Memory coherence and sequential consistency models. Shared-		1
and switches, bus-	based cache coherence protocols and synchronization mechanisms. Virtual shared memory architectures: distributed cache-coherer mechanisms - barriers. Clusters: fast communication networks and protocols.	ice protocols. Synd	chronization
XP36STR	Stringology	ZK	4
Processing of strir	ngs and sequences. General, ordered alphabet. Generalized and weighted strings. Finite and infinite alphabet. Searching in text, diction	onaries and langua	-
	atching. Forward and backward matching. Searching in compressed text. Searching in more-dimensional text. Searching for longest comm Searching for regularities in text. Construction of covering of text. Representation of text, prefix, suffix and factor automata, suffix trees		osequences.
XP36VAP	Advaced Computer Architecture	ZK	4
Instruction level pa	arallelism (pipelined, superpipelined and superscalar systems). Basic limitations to parallelism (structural, data and control hazards).	nstruction fetch ar	d execution
	out of order). Register data flow, software and hardware solutions, interlocking, scoreboard, control stack. Memory reuse, register renam , performace evaluation, HPCC, supercomputers. Shared memory multiprocessors (bus, switch, switched memory). Interconnection s	•	•
	ultiprocessor systems. MIMD systems UMA, NUMA, COMA. Distributed memory multiprocessors (crossbar switch). Data flow systems		
XP36VPD	special architectures. Selected Parts of Data Mining	ZK	4
	selected Parts of Data Minning It revealing non-trivial, hidden and ultimately applicable knowledge in large data. This course focuses on two key data mining issues: da		1
When dealing with	large data, it is important to resolve both the technical issues such as distributed computing or hashing and general algorithmic com	plexity. In this part	, the course
	nainly by case studies on web and social network mining. The second part will discuss approaches that merge heterogeneous prior kr will make the main application field here. It is assumed that students have completed the master course on Machine Learning and Da	-	

XP37AEM Acoustic and Electroacoustic Measurements Z,ZK	4			
Measurement of acoustic pressure, measuring microphones. Measurement of acoustic impedance. Foundamental audiometric measurements, artificial ear. Measurement of a				
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.	4			
XP37APF Acoustics and Electroacoustics of Solid State Z,ZK	4			
Waves in elastic isoptropic unbounded continuum. Wave equation. Scalar and vector potential. Plane harmonic uniform and non-uniform wave. Energy and power in plane har 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 -guic				
solids. Wave propagation in cylindrical wave-guide. Solid-state waveguides of non-uniform cross-section. Piezoelectricity. Equivalent circuits of piezoelectric transducers for gen				
of volume and surface waves.	loration			
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 ZK	4			
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: abs	orption			
of sound, sound insulation. Simple and complex constructions. Criteria for sound insulation properties of building constructions. Measurement in acoustics of constructions. Calcu	ulations			
in room acoustics.				
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)				
parameters of satellite communication channel. Energetic budget of satellite link. Satellite link design. Frequency bands. Modulations and multiplexes: TDMA, FDMA and CDMA. spectrum communication. Systems VSAT, DAMA, DVB-S, S-UMTS. Multimedia satellite services. Satellite navigation systems: GPS, GLONASS and GALILEO. Satellite commun				
and navigation systems - SAT, DAMA, DVD-S, S-OM TS. Multimedia satellite services. Satellite navigation systems. GPS, GLONASS and GALILEO. Satellite communication.	lication			
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 surroun	-			
acoustic space, finite element method, calculation of eigenfrequencies.	Janig			
XP37FHA Physiological, Psychological and Musical Acoustics ZK	4			
Anatomy of the hearing organ, hearing theory, hearing field, loudness, masking, pitch of sound, temporal tresholds, distortion in the hearing organ, adaptation, fatigue and impa	-			
of hearing system. Binaural hearing, objective and subjective properties of musical signals, statistical and dynamical analysis. Perception of simple tones and complex sour	nds,			
consonancy and dissonancy. Psychoacoustics of transmission of the musical signal. Methods of psychoacoustic measurements, their validity, repeatability. Planning and realize	zation			
of listening tests, methods of statistical analysis of results, interpretation.				
XP37FHA1   Physiological, Pychologycal and Musical Acoustics 1   ZK	4			
Properties of musical signal in temporal and frequency domains, methods of sound synthesis, timbre and interpretation of sound spectra, objective assessment of timbre, the				
sound quality, introduction to acoustics of speech and singing, physicalacoustic principles of musical instruments, tuning, dynamics, timbre of the tone, radiation properties of r	musical			
instruments, introduction to methodology of measurement of musical instruments.	4			
XP37FOS Photonic Imaging Systems ZK	4			
Image and its representation. Energetic image description. Principles of image acquisition, transferring and storing. Image entropy function, 2 dimensional autocorrelation curv probability image description. Novel compression techniques. Image reproduction, matrix description. Light diffraction. 2D transfer functions - PSF, MTF, PSF, MTF of real imagi				
detection systems. 2D transfer systems and their signal distortion, image aberration and their correction, toleration analysis of optical system. Receivers and transmitters for s	-			
application. Photonic processors, computers and memories.	poolai			
XP37FZS Fuzzy Signal Processing Z,ZK	4			
PhD students education and their research activities are focused on the problems of utilize fuzzy logic and neural network for optimization algorithm used at numerical signal proc	cessing			
as adaptive filtration, diagnostic of the signal, control phase lock and so on.	-			
XP37GAB Genesis and Analysis of Biosignals ZK	4			
The subject deals with genesis and description of the most important biological signals of both electric and non-electric nature. Properties of the biosignal, essential for the consequences of the biosignal description of the most important biological signals of both electric and non-electric nature.	quential			
signal processing, are studied. Finally, simple and advanced methods of biosignals pre-processing, analysis and evaluation are presented for each the biosignal.				
XP37LN Aircraft Navigation ZK	4			
XP37MPS Multimedia Signals Transmission ZK	4			
Generalized communication system scheme. Extended knowledges in radio transmitters and radio receivers. Radio transmitters and receivers system design. Satellite commun	nication			
systems. Public cellular radiotelephone systems. Terrestrial and satellite digital broadcasting. Analog and digital radiorelay systems. Metallic communication systems. Noncoh				
and coherent optoelectronic communication systems. Modulation and multiplexing in optoelectronic systems. Cable television networks, interactive television systems. Mob	bile			
radiocomunications development trends. Electromagnetic compatibility.	4			
XP37MSC CNS Modern Systems ZK	4			
XP37MVP     Scientific Work Methodology     ZK	4			
Targeting and motivation of scientific work, exploitation of literature and other information resources, accessible databases, fundamentals of project preparation, examples of so				
projects, formal requirements (PhD Thesis, article, conference), patents and patent search, Internet exploitation, discussion groups, WWW presentations, project presentat				
XP37NRO         CAD for RF and Microwave Circuits         Z,ZK           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         Image: Comparison of the models of	4			
circuits. Enhancing the model accuracy with artificial neural networks (ANN). Advanced algorithms for analysis and optimization of RF and microwave circuits. Model parameter extr				
XP37ODS         Optical Design and Simulation         ZK	4			
XP37PKP         Biomedical Engineering in Clinical Practice         ZK	4			
Solving methods of practical problems that a biomedical engineer has to overcome in the clinical practice. Position of BME in research and in the clinical practice. Guidelines for	-			
and clinical experiments - design, conducting and evaluation, statistical analysis used in medicine. Thermodynamics of gas mixtures. Humidification of ventilation gases. Evaport				
of anaesthetical substances. Systems with compressible fluids. Measurement of physical parameters in rigid and compliant systems. Basic parts of pneumatic systems in medic				
generators, generators of airflow and pressure, gas blenders, etc.). Modelling and analysis of biological systems using electrical analogy, practical applications. Analysis of body	y fluids.			
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 Radioelectronics ZK	4			
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 flu	uíds.			
Dynamics of vascous fluids. Stationary flow of vascous fluid.				

XP37SRP	Radio Receivers Special Technology	ZK	4
	dvanced radio receivers technology. Basic structure classical and modern software defined radio receivers. Technical parameters radi		
radiobroadcasting	and television receivers. Professional radiocommunication receivers and transceivers. Diversity techniques. Spread spectrum radio re-		narrowband
VD27070	and broadband amplifiers. Oscillators and frequency synthesizers. Mixers and demodulators. Radio receivers system desig		4
XP37SZS	Statistical Signal Processing tion and detection theory. General properties and fundamental limits. ML, LS, Bayes (MAP,MSE), NP, MM estimators and detectors. A	Z,ZK	4 v (Kalman
	RLS). Iterative detection and parameter estimation.		y (Maiman,
XP37TAS	Acoustic signal processing and theory	Z,ZK	4
	classification, sources, description of properties. Statistical analysis of acoustic signals. Spectral analysis of signals, Fourier transform	· · ·	-
-	e Fourier Transform, Wavelet transform, Wigner-Ville distribution. Cepstral analysis and its application in acoustics. Discrete signal pro		
perception. Oversa	mpling, noise shaping. Granulation noise, dithering, signal requantization. Acoustic signal acquisition and data pre-processing. Impulse me	asurements of elec	tro-acoustic
systems. System a	inalysis using swept and time delayed acoustic signals. Pseudorandom signals and their application in acoustic system analysis. Digital	processing of mus	ical signals.
XP37TEA	Theoretical Eletroacoustics	Z,ZK	4
	in fluids and solids. Systems of lumped and distributed parameters in solids. Equivalent circuits of membranes and plates. Reciprocal		-
	-reciprocal transducers (opto and thermoacoustical transducers, piezoresistive transducer). Electromechanical and electroacoustical ts. Radiation, radiation impedance. Acoustic transmitters, directivity. Acoustic receivers. Acoustical systems with lumped and distributed e		-
	air-gaps. Coupled systems.		wavegulaes,
XP37TMP	Medical Instrumentation	ZK	4
	with principles and properties of medical systems for analysis of body fluids, blood gas analysis, medical minors of basic life function	1 1	=
-	ermodynamic principles of anaesthetic equipment and equipment for artificial lung ventilation, haematological analysers and other m		-
XP37VKF	Selected Parts from Photonics	ZK	4
Anatomy and phys	iology of vision. Integral photonic sensors. Panoramatic (image) photonic sensors. Integral photonic displays. Panoramatic photonic d	isplays. Electron or	otics. Image
converters. Specia	I photonic elements. Basic elements of optical systems. Fundamentals of illumination. Fiber-optics elements and systems. Optical methylical methylical systems and systems.	ods of information	processing.
	Optical (photonic) processors.		
XP37VRA	Research Seminars in Radioelectronics and Acoustics	Z,ZK	4
The course is inter	nded for PhD students of the radioelectronics and acoustics specialization. It develops the presentation skills and serves as a platform	i for discussion and	defence of
VD077I	students' research results.	771	4
XP37ZI Magnetic recordi	Information recording ng theory. FM signal recording. Video information recording systems. High density recording, tape recorder thin heads. Impulse record	Z,ZK	4 on Digital
-	D-audio, DAT. Digital recording on CD-ROM, CD-video. WORM, CD-R recording. Erasable magneto-optical recording on MD. Digital vi		-
	compression.	uoo roooranig. ooa	ing, aata
XP37ZSN1	Signal processing in satellite navigation systems 1	Z.ZK	4
	rement with pseudorandom signals and with carrier. Position determination based on measured distances. Time delay discriminator.	I ' I	-
	receiver. GDOP, PDOP, HDOP, VDOP. GPS system, precision. Glonass and its precision. GALLILEO. Comparison of these sys	tems.	
XP37ZSN2	Signal processing in satellite navigation systems 2	Z,ZK	4
Doppler satellite	navigation systems, structure of receiver and precision of position measurement. Shortcomings of satellite systems: limited access a	and integrity, RAIM	and GIC,
augmentation.	Differential systems DGPS and DGLONASS, RTCM-104 standard. Systems SKY-FIX, FUGRO, RACAL, WAAS, EGNOS. GALILEO a	nd its prospective.	GPS III.
XP38EMC	Electromagnetic Compatibility of Data Acquisition Systems	ZK	4
EMC - basic terms	. Measurement of electromagnetic emission and immission. EMC standards. Modelling of disturbing signals. Electromagnetic disturba	nce in laboratory a	nd industry.
VDOONDD	Design of DAQ systems with regard to EMC. EMC of data transmitting lines.	71/	
XP38MDR	Methods of Signals Digitalization and Reconstruction d unconventional methods of analog preprocessing of typical sensors signals, selection of optimal digitization methods and optimization	ZK ZK	4 on including
The up-to-date and	of processing of measurement results to achieve high accuracy and effective suppression of disturbing signals.	or hardware solution	on including
XP38MMN	Measurement of Nonelectric Quantities	ZK	4
	es of sensors. Measurement of temperature, pressure, flow, movement, position and other physical quantities. Chemical sensors and	1 1	
, , ,	ion of explosives. New types of signal conditioning circuits. Sensor Applications in industry, transport and consumer electronics. Secu		
	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 standard	s of electrical quantities. Collective standards. Inductive ratio devices for precision electrical measurements and possibilities of improving	their metrological	parameters.
Modern methods f	or precision measurement of active and passive electrical quantities. Evaluation of measurement errors and uncertainties. Metrologic	al reliability. Statistic	cal analysis
	of measurement data.		
XP38MPX	Magnetism in Engineering Practice	ZK	4
Students will be in	troduced into the magnetic materials, magnetic sensors and engineering magnetism including FEM design and magnetic measureme this advanced course can be modified according to the students' needs.	nts and testing. The	e content of
XP38PSL	Aircraft Instrumentation	ZK	4
	aints students with the current technology used in aircraft with respect to instruments, systems and sensors working in the low-freque	I I	
	of system data. The course includes a detailed description of aircraft instrumentation and its resistance to external influences, a descri	-	
	al engineering, analysis of instruments and systems for measurement of engine and aerometric quantities, and a description of emergen	-	
It thus develops th	e background related to nowadays technology and methodology utilized on aircraft. The course provides a detailed overview of quant	itative and qualitativ	ve research
and analytical me	thods and their integration into signal/data processing and aircraft system design principles. The last part of the course discusses the	current publishing	activities in
	the field of aircraft instrumentation.		
XP38PUC		ZK	2
XP38SSB			
	Sensors and Buses	ZK	4
	introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical principl	es, sensor types an	nd important
parameters, the co	introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical principl ncept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration and diag	es, sensor types an	nd important
	introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical principl ncept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration and diag immunity.	es, sensor types an gnostics, noise and	nd important disturbance
XP38SYS	introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical principl ncept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration and diag	es, sensor types an gnostics, noise and ZK	nd important disturbance 4
XP38SYS The subject introd	introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical principl ncept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration and diag immunity. Measurement and Data Acquisition Systems	es, sensor types an gnostics, noise and ZK dware and software	d important disturbance 4 e aspects of
XP38SYS The subject introd	introduced into the advanced topics of engineering sensors and sensor networks. Topics include: Sensor applications, physical principl ncept of smart sensors, measurement systems, analog circuits for sensor signal processing, sensor error correction, calibration and diag immunity. Measurement and Data Acquisition Systems uces the principles and technical means of data acquisition in the laboratory and industrial environment. Attention is paid to both hard	es, sensor types an gnostics, noise and ZK dware and software	d important disturbance 4 e aspects of

		714		
XP38VDI	Selected Chapters of Diagnostics	ZK	4	
	uces advanced concepts of fault detection, isolation and diagnostics, signal analysis methods for machine condition monitoring, and p			
of non-destr	uctive testing, the corresponding advanced signal processing, and self-acting evaluation in order to improve reliability, availability, main	ntenance, and life-	time.	
XP38VKP	Selected Parts of Instrumentation	ZK	4	
The course is de	dicated to principle, properties and applications of selected special measuring instruments. It deals mainly with calibrators and other se	ources of calibration	on signals,	
devices for measur	ement of extremely low voltage and current signals, lock-in amplifiers, power analyzers and electronic loads, devices used for EMC meas	surements, real-tim	ne spectrum	
analyzers, metallic	and optical reflectometers and radio testers (Bluetooth, NMT, GSM, UMTS). A special part is devoted to sampling measurement method	ds and virtual instr	umentation.	
XP38VKZ	Selected Chapters of Signal Processing	ZK	4	
The course is de	dicated to advanced signals processing methods used in contemporary electronic devices and measuring instruments. It concerns e.	g. the other types	of integral	
transformation (e	xcept Fourier), stochastic methods, processing of the multimedia signal, suppressing of unwanted effect, methods used for quality inc	reasing of multime	edia signal	
	transmission, etc.			
XP39PMV	Advanced Methods of Visualization	ZK	4	
Scientific visualization based on physical models. Scientific visualization and volume rendering. Volume graphics. Information visualization. Interaction in scientific visualization				
env	ironment. Scientific visualization in WWW environment. Particle models and visualization of technological processes. Computational f	luid dynamics.		
XP39SPG	Computer Graphics Seminar	Z,ZK	4	
The computer grap	hics seminar will cover selected research topics in computer graphics such as efficient rendering techniques, modeling of surface materia	als and their optica	I properties,	
simulation of natural phenomena, geometrical modeling and animation. In the seminar we will also discuss computer graphics techniques used in related research disciplines such as				
image processing, computer vision and human computer interaction based on the particular topics of PhD theses of the participating students. The goal of the course is to introduce				
the sele	ected topics to the students and by analyzing selected highly influential research publications to further develop the research capabiliti	es of the students		
XP39VPG	Computational Geometry	ZK	4	
Principles of comp	utational geometry (CG), data structures and paradigms, methods of geometric search, convex polygons and hulls, applications of co	nvex hull, proximit	y problems,	
Voronoi diagrams, triangulation, efficient intersection algorithms, intersection of semispaces and polygonal regions, geometry of rectangles, dual mappings and spaces, convex hull in				
	dual space, algorithms of computer graphics and CG. Students who completed course 36VGE cannot enroll.			
XP39VR	Virtual reality	ZK	4	
Advanced method	s in the VRML language. Standard and non-standard extensions to the VRML language. Programming of external applications with E $_{ m c}$	Al interface. Multi-	user virtual	
	reality. Distant cooperation in virtual environment. Hardware and software support for virtual reality systems. QuickTime VR. Specification X3D.			

For updated information see <u>http://bilakniha.cvut.cz/en/FF.html</u> Generated: day 2025-06-24, time 14:55.