

Study plan

Name of study plan: Komunikace, multimédia a elektronika - Multimediální technika

Faculty/Institute/Others: Faculty of Electrical Engineering

Department: Department of Radioelectronics

Branch of study guaranteed by the department: Multimedia Technology

Garantor of the study branch: prof. Ing. Miloš Klíma, CSc.

Program of study: Communications, Multimedia, Electronics

Type of study: Follow-up master full-time

Required credits: 103

Elective courses credits: 17

Sum of credits in the plan: 120

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 68

The role of the block: P

Code of the group: MKMEBME

Name of the group: Safety of the master's studies

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 1 course

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
A2M17BP3	Safety in Electrical Engineering 2 Milan Polívka	Z		2+2j	Z	P

Characteristics of the courses of this group of Study Plan: Code=MKMEBME Name=Safety of the master's studies

A2M17BP3	Safety in Electrical Engineering 2				Z	
The purpose of the course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it, safety work with electrical equipment, basics of the first aid at injury by electric current. Students receive qualification that enables them to work on electrical equipment which is necessary for their work in the Faculty of Electrical Engineering, Czech Technical University (Dean's order No. 1/2007).						

Code of the group: MDIP

Name of the group: Diploma Thesis

Requirement credits in the group: In this group you have to gain at least 25 credits (at most 400)

Requirement courses in the group: In this group you have to complete at least 1 course

Credits in the group: 25

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
A0M02DIP	Diploma Thesis	Z	25	36s	L	P
A0M13DIP	Diploma Thesis	Z	25	36s	L	P
A0M14DIP	Diploma Project	Z	25		L	P
A0M15DIP	Master's thesis	Z	25	36s	L	P
A0M16DIP	Diploma thesis	Z	25	36s	L,Z	P
A0M17DIP	Diploma Thesis Miloš Mazánek	Z	25	36s	L	P
A0M31DIP	Diploma Thesis	Z	25		L	P
A0M32DIP	Diploma project Miroslav Vondrák	Z	25	36s	L	P

A0M33DIP	Diploma Thesis	Z	25	36s	L	P
A0M34DIP	Diploma Thesis	Z	25	36C	L	P
A0M35DIP	Diploma Thesis	Z	25	36s	L	P
A0M37DIP	Diploma Thesis <i>Petr Kačmařík</i>	Z	25	36s	L	P
A0M38DIP	Diploma Thesis	Z	25	0P+36C	L	P
A0M39DIP	Master Thesis	Z	25		L	P
A0M36DIP	Diploma Thesis	Z	25	14s	L,Z	P
ADIP25	Diploma Thesis	Z	25	36s	L	P

Characteristics of the courses of this group of Study Plan: Code=MDIP Name=Diploma Thesis

A0M02DIP	Diploma Thesis	Z	25			
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.						
A0M13DIP	Diploma Thesis	Z	25			
Independent final comprehensive work for the Master's degree study program. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.						
A0M14DIP	Diploma Project	Z	25			
A0M15DIP	Master's thesis	Z	25			
A0M16DIP	Diploma thesis	Z	25			
A0M17DIP	Diploma Thesis	Z	25			
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination. Diploma projects deals with microwave technique, antennas, propagation, optical communications, EMC, and medical applications.						
A0M31DIP	Diploma Thesis	Z	25			
A0M32DIP	Diploma project	Z	25			
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.						
A0M33DIP	Diploma Thesis	Z	25			
A0M34DIP	Diploma Thesis	Z	25			
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.						
A0M35DIP	Diploma Thesis	Z	25			
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.						
A0M37DIP	Diploma Thesis	Z	25			
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.						
A0M38DIP	Diploma Thesis	Z	25			
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.						
A0M39DIP	Master Thesis	Z	25			
A0M36DIP	Diploma Thesis	Z	25			
ADIP25	Diploma Thesis	Z	25			
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.						

Code of the group: MKMEP

Name of the group: Compulsory subjects of the programm

Requirement credits in the group: In this group you have to gain 37 credits

Requirement courses in the group: In this group you have to complete at least 7 courses

Credits in the group: 37

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
A2M17AEK	Antennas and EMC in Radiowave Communication <i>Pavel Hazdra</i>	Z,ZK	5	2+2L	L	P
A2M99CZS	Digital Signal processing <i>Libor Seidl</i>	Z,ZK	5	2+2c	Z	P
A2M37DKM	Digital communications <i>Jan Sýkora</i>	Z,ZK	4	3+1s	Z	P
A2M99MAM	Microprocessors and microcomputers	Z,ZK	6	2+2L	L	P
A2M32MKS	Mobile Communication Networks <i>Robert Bešťák</i>	Z,ZK	4	2+2L	Z	P

A2M01PMS	Probability and Statistics	Z,ZK	8	4+2	Z	P
A2M34SIS	Integrated System Structures <i>Vítězslav Jeřábek, Jiří Jakovenko, Vladimír Janiček, Jan Novák Jiří Jakovenko Jiří Jakovenko (Gar.)</i>	Z,ZK	5	2P+2C	Z	P

Characteristics of the courses of this group of Study Plan: Code=MKMEP Name=Compulsory subjects of the programm

A2M17AEK	Antennas and EMC in Radiowave Communication	Z,ZK	5	Student obtains the knowledge of basic analysis and design of the individual type of the antennas (wire, planar, reflector and lens antennas, and radomes) and antenna arrays. He obtains the basic experience in antenna and communication technique, antenna measurement technique including training in specialized antenna anechoic laboratory. He also obtains the basic knowledge in the field of electromagnetic compatibility - electromagnetic interference and susceptibility including testing methods and criteria of selecting of antennas for given fixed, mobile, ground and satellite service.		
A2M99CZS	Digital Signal processing	Z,ZK	5	The subject gives overview about basic methods of digital signal processing and their applications (examples from speech and biological signal processing): discrete-time signals and systems, signal characteristics in time and frequency domain, Fourier transform, fast algorithms for DFT computation, introduction to digital filter design, digital filtering in time and frequency domain, decimation and interpolation and their usage in filter banks, basics of LPC analysis.		
A2M37DKM	Digital communications	Z,ZK	4	The course focuses on the area of digital modulation, coding and physical layer signal processing in communication systems. The exposition is systematically built along the theoretical line which allows to reveal all inner connections and principles. This allows the students to develop the knowledge in an active way and use it in a design and construction of the communication systems. In a broad area of the digital communications, we focus on the essential principles. Those are further extended in the optional courses.		
A2M99MAM	Microprocessors and microcomputers	Z,ZK	6	The aim is to make students acquainted with the properties of microprocessor systems, make students familiar with on-chip peripherals, connect external circuit to the processor bus, and with implementation of the memory or I/O space address extension. Next, taught the students to make simple program in the assembly language, C language and combination of both. After completion of this subject student should be able to design and implement simpler microprocessor system including connection of necessary peripherals and software design.		
A2M32MKS	Mobile Communication Networks	Z,ZK	4	The goal of the course is to provide an overall overview of mobile communications in the variety of analog and digital systems. The main emphasis is put onto contemporary GSM network (including new supplementary technologies) and onto the transition towards 3rd generation networks (UMTS, LTE, ...). It also deals with the area of mobile communications based on employment of telecommunication satellites; public and private radio / paging systems and radio networks are discussed as well.		
A2M01PMS	Probability and Statistics	Z,ZK	8	The course covers probability and basic statistics. First classical probability is introduced, then theory of random variables is developed including examples of the most important types of discrete and continuous distributions. Next chapters contain moment generating functions and moments of random variables, expectation and variance, conditional distributions and correlation and independence of random variables. Statistical methods for point estimates and confidence intervals are investigated.		
A2M34SIS	Integrated System Structures	Z,ZK	5	Design methodologies of analog, digital and optoelectronics integrated systems. Description of integrated circuits fabrication process; CMOS technologies and its modern sub-micron trends; design rules and layout design. Design and fabrication process of micro-electro-mechanical systems (MEMS); polymer based technologies; optical and optoelectronic integrated circuits, fabrication process and technologies, materials, design and testing.		

Code of the group: MKMEPRO

Name of the group: Project

Requirement credits in the group: In this group you have to gain 6 credits

Requirement courses in the group: In this group you have to complete 1 course

Credits in the group: 6

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
A2M32IND	Individual Project <i>Ivan Pravda Miroslav Vondrák (Gar.)</i>	KZ	6	4s	Z,L	P
A2M31IND	Project	KZ	6		Z	P
A2M37IND	Individual Project	KZ	6	4s	Z	P
A2M17IND	Individual Project <i>Miloš Mazánek, Ladislav Oppl, Milan Polívka, Jan Šístek Miloš Mazánek Miloš Mazánek (Gar.)</i>	KZ	6	4s	Z	P
A2M34IND	Individual Project <i>Vítězslav Jeřábek, Jiří Jakovenko, Vladimír Janiček, Jan Novák, Miroslav Husák, Vít Záhřava, Jan Vobecký, Jan Voves, Michal Janoušek, Miroslav Husák Miroslav Husák (Gar.)</i>	KZ	6	4C	Z	P

Characteristics of the courses of this group of Study Plan: Code=MKMEPRO Name=Project

A2M32IND	Individual Project	KZ	6	Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.		
A2M31IND	Project	KZ	6			
A2M37IND	Individual Project	KZ	6	Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.		
A2M17IND	Individual Project	KZ	6	Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject. Projects deals with microwave technique, antennas, propagation, optical communications, EMC, and medical applications.		

A2M34IND	Individual Project	KZ	6
Independent work in the form of a project. A student will choose a topic related to his or her branch of study, which will be specified department or branch departments. The project will be defended within the framework of a subject.			

Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 27

The role of the block: PO

Code of the group: MKMEPO2

Name of the group: Compulsory subjects of the branch

Requirement credits in the group: In this group you have to gain 27 credits

Requirement courses in the group: In this group you have to complete at least 5 courses

Credits in the group: 27

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
A2M34MIM	Microsystems in Multimedia Miroslav Husák, Adam Bouřa Miroslav Husák Miroslav Husák (Gar.)	Z,ZK	5	2P+2C	L	PO
A2M37OBT	Image Technology Karel Fliegel	Z,ZK	6	2+2c	Z	PO
A2M31SMU	Signals in multimedia	Z,ZK	5	2+2c	L	PO
A2M31ZRE	Speech processing	Z,ZK	6	2+2c	Z	PO
A2M37ZVT	Audio Technology	Z,ZK	5	2+2L	L	PO

Characteristics of the courses of this group of Study Plan: Code=MKMEPO2 Name=Compulsory subjects of the branch

A2M34MIM	Microsystems in Multimedia	Z,ZK	5	The subject solves systems working in interdisciplinary areas, the most frequently in the energy interface - optical, thermal, mechanical, electrical). There are explained physical principles of any sensors, especially of optical and mechanical quantities, principle of biometric pick-up information, principle of tactile display, etc. There re solved the basic methods of the signal pre-processing. Basic principles of actuators are described, ones are using for the control in instruments and systems of multimedia applications. The attention is focused on MEMS elements and systems and their applicability in modern instrument technology.		
A2M37OBT	Image Technology	Z,ZK	6	This course deals with multimedia technology and it is focused mainly on acquisition, processing and reproduction of image information. It covers area of measurements in photometry, radiometry and colorimetry; design of objective lenses, image sensors and displays including their parameters. Further the course deals with cinematography, photography and with other special methods of image reproduction, e.g. polygraphy and digital printing techniques. Studied problems are completed with explanation of advanced methods of image processing (preprocessing, compression, image reconstruction, etc.).		
A2M31SMU	Signals in multimedia	Z,ZK	5	Course brings information about methods of sinal processing used in multimedia including 2-D analysis and modern methods.		
A2M31ZRE	Speech processing	Z,ZK	6	The subject is devoted to basis of speech processing addressed to students of master program with special focus on multimedia applications. Discussed speech technology is currently applied in many systems in different fields (e.g. information dialogue systems, voice controlled devices, dictation systems or transcription of audio-video recordings, support for language teaching, etc.). Further information can be found at http://noel.feld.cvut.cz/vyu/a2m31zre . Detailed information for registered students can be found at teaching portal http://moodle.kme.feld.cvut.cz .		
A2M37ZVT	Audio Technology	Z,ZK	5	The course deals with topics from electro acoustics, sound reinforcement, related signal processing in conjunction with psychoacoustic aspects. It prepares experts for studio practice, design of sound reinforcement and specialized field in signal processing.		

Name of the block: Elective courses

Minimal number of credits of the block: 8

The role of the block: V

Code of the group: MKMEEM

Name of the group: Economically-management subjects

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 18)

Requirement courses in the group: In this group you have to complete at least 1 course

Credits in the group: 4

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
A0M16EKE	Economy of Power Industry	KZ	4	2+2s	Z,L	v

A0M32KMP	Communications and Media Law <i>Zdeněk Brabec, Petr Ondráček Zdeněk Brabec Zdeněk Brabec (Gar.)</i>	Z,ZK	4	2+2c	Z	v
A0M16MGM	Management <i>Jaroslav Knápek, Milana Hrubá Jaroslav Knápek (Gar.)</i>	Z,ZK	5	2+2s	Z,L	v

Characteristics of the courses of this group of Study Plan: Code=MKMEEM Name=Economically-management subjects

A0M16EKE	Economy of Power Industry Fundamentals of financing of power companies. Cost structure of power generation and distribution. Prices and tariff systems for power, heat and gas production and distribution. Examples of economic evaluation and investment appraisal of the typical project in power sector. Renewable energy sources, externalities. Energy policy and energy law in CR. Liberalization and power market development.				KZ	4
A0M32KMP	Communications and Media Law A complex course dedicated to interdisciplinary problems - the legal aspects of electronic communications (information and communications systems), as well as media from the viewpoint of European and national law. It analyses the areas of informatics, electronic communications, information society services, copyright and general intellectual property rights, the protection of identity, introduction to software law and the Internet as a global communication and information system.	Z,ZK				4
A0M16MGM	Management The methods and procedures of effective management for company leading in competitors area.				Z,ZK	5

Code of the group: MKMEH

Name of the group: Humanities subjects

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 28)

Requirement courses in the group: In this group you have to complete at least 1 course

Credits in the group: 4

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
A0B16FIL	Philosophy <i>Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.)</i>	ZK	2	2+0s	Z,L	v
A0M16FI2	Philosophy II <i>Peter Zamarovský</i>	Z,ZK	4	2+2s	L	v
A0B16HTE	History of technology and economic <i>Marcela Efmertová, Jan Mikeš Marcela Efmertová Marcela Efmertová (Gar.)</i>	ZK	2	2+0s	Z,L	v
A0M16HT2	History of science and technology 2 <i>Jan Mikeš</i>	Z,ZK	4	2+2s	L	v
A0B16MPL	Management psychology <i>Jan Fiala Jan Fiala Jan Fiala (Gar.)</i>	ZK	2	2+0s	Z,L	v
A0M16MPS	Psychology <i>Jan Fiala Jan Fiala Jan Fiala (Gar.)</i>	Z,ZK	4	2+2s	Z,L	v
A003TV	Physical Education	Z	2	0+2	L,Z	v
A0M16TE1	Theology <i>Vladimír Slámečka Vladimír Slámečka Vladimír Slámečka (Gar.)</i>	Z,ZK	4	2+2s	L	v

Characteristics of the courses of this group of Study Plan: Code=MKMEH Name=Humanities subjects

A0B16FIL	Philosophy				ZK	2
A0M16FI2	Philosophy II The course is oriented on the transdisciplinary aspects of philosophy, informatics, physics, mathematics and biology.				Z,ZK	4
A0B16HTE	History of technology and economic				ZK	2
A0M16HT2	History of science and technology 2 This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers				Z,ZK	4
A0B16MPL	Management psychology Psychology of personality, psychology of work and organization. Psychology in human resources management. The manager, his role and competencies. Motivation and engagement. Skills development. Communication and conflict resolution. Work group and team, conducting meetings. Time management and delegation. Dealing with stress and emotions. Company culture and organizational change.				ZK	2
A0M16MPS	Psychology				Z,ZK	4
A003TV	Physical Education				Z	2
A0M16TE1	Theology This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which grows our civilization up.				Z,ZK	4

Code of the group: MJK

Name of the group: Language courses

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
A0B04GA	<i>Petra Jennings Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04KA	English Conversation 2 <i>Markéta Havlíčková Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04OA	Technical English Course <i>Markéta Havlíčková Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
AE0B04C0	Czech language 0 <i>Markéta Havlíčková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04CIN	<i>Markéta Havlíčková Dana Saláková (Gar.)</i>	Z	2	0+2	*	v
A0B04KF1	French conversation 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04KF2	French conversation 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04F1	French language 1 <i>Markéta Havlíčková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04F2	French language 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04F3	French Language 3 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04JAP	Japanese <i>Markéta Havlíčková Dana Saláková (Gar.)</i>	Z	2	0+2	*	v
A0B04GN	German Grammar <i>Dana Saláková Dana Lisá (Gar.)</i>	Z	2	2s	Z,L	v
A0B04KN	German Conversation <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04KN2	German conversation 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04N1	German language 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04N2	German language 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04N3	German language 3 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04ON	Professional German <i>Dana Saláková Dana Lisá (Gar.)</i>	Z	2	2s	Z,L	v
A0B04CAE1	Certificate of Advanced English CAE 1 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04CAE2	Certificate of Advanced English CAE 2 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04CAE3	Certificate of Advanced English CAE 3 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04CAE4	Certificate of Advanced English 4 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z		2s	Z,L	v
A0B04FCE1	FCE 1 <i>Petra Jennings Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04FCE2	FCE 2 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04FCE4	FCE4 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04FCE3	FCE 3 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04PZP	Preparation for stay in Germany <i>Dana Lisá</i>	Z	2	2s	*	v
A0B04RET	Rhetoric <i>Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04KR	Russian conversation <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	Z,L	v
A0B04KR2	Russian conversation 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04R1	Russian language 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04R2	Russian language 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04R3	Russian language 3 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04R4	Russian language 3 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04KS1	Spanish conversation 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v

A0B04KS2	Spanish conversation 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04S1	Spanish language 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04S2	Spanish language 2 <i>Dana Saláková Dana Lisá (Gar.)</i>	Z	2	2s	*	v
A0B04S3	Spanish language 3 <i>Dana Saláková Dana Lisá (Gar.)</i>	Z	2	2s	*	v
A0B04S4	Spanish Language 4 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2s	*	v
A0B04CA	Technical English for Pre-Intermediate <i>Markéta Havlíčková Dana Saláková (Gar.)</i>	Z	2	2s	L	v

Characteristics of the courses of this group of Study Plan: Code=MJK Name=Language courses

A0B04GA		Z	2		
The aim of this course is to extend and complement grammatical patterns covered in other English courses that are intended for full-time students. The course is meant mainly as a supplement for students who have not yet passed the B2 examination and are interested in further study and additional practice.					
A0B04KA	English Conversation 2	Z	2		
The course is designed for students who want to develop their communication skills. Students will be given the opportunity to use the vocabulary they already know, as well as learn new words and phrases, to communicate on a variety of topics and themes. This course is not designed for beginners.					
A0B04OA	Technical English Course	Z	2		
The course is designed for students who have completed the B2 English course. Its main objective is to prepare students for the study of selected specialized courses in English by covering a broader range of topics in engineering. In addition to teaching materials aimed at expanding technical vocabulary and consolidating current language skills, the focus is on authentic articles adapted from professional journals and accompanying videos. The syllabus also leaves space for students' presentations covering various fields of science.					
AE0B04C0	Czech language 0	Z	2		
The course is aimed towards ERASMUS students - especially beginners. The course is taught on the basis of English language support. The goal of the course is to give the students first hand information about pronunciation, vocabulary and grammar structure of the Czech language, and also provide them with basic useful phrases needed for everyday communication during their stay in the Czech Republic.					
A0B04CIN		Z	2		
A0B04KF1	French conversation 1	Z	2		
A0B04KF2	French conversation 1	Z	2		
A0B04F1	French language 1	Z	2		
A0B04F2	French language 2	Z	2		
A0B04F3	French Language 3	Z	2		
A0B04JAP	Japanese	Z	2		
A0B04GN	German Grammar	Z	2		
A0B04KN	German Conversation	Z	2		
A0B04KN2	German conversation 2	Z	2		
A0B04N1	German language 1	Z	2		
A0B04N2	German language 2	Z	2		
A0B04N3	German language 3	Z	2		
A0B04ON	Professional German	Z	2		
A0B04CAE1	Certificate of Advanced English CAE 1	Z	2		
The aim of the course is to prepare for Certificate of Advanced English - the second highest level Cambridge ESOL exam. The course CAE1 covers units 1-4. Studying for CAE helps you to improve your language skills (reading, writing, English in use, listening and speaking) and use them in a wide range of contexts. The exam is based on realistic tasks and indicates the ability to use the language in practical situations. You will be able to participate in meetings and discussions, expressing opinions clearly and be able to understand and produce texts of various types. CAE is recognised by the majority of universities in English speaking countries as proof of adequate language skills for courses taught and assessed in English as well as by employers who require knowledge of a foreign language. CAE is taken by more than 60 000 people each year in more than 60 countries. It is possible but not necessary for obtaining credit to take CAE at British Council.					
A0B04CAE2	Certificate of Advanced English CAE 2	Z	2		
The aim of the course is to prepare for Certificate of Advanced English - the second highest level Cambridge ESOL exam. The course CAE2 covers units 5-8. Studying for CAE helps you to improve your language skills (reading, writing, English in use, listening and speaking) and use them in a wide range of contexts. The exam is based on realistic tasks and indicates the ability to use the language in practical situations. You will be able to participate in meetings and discussions, expressing opinions clearly and be able to understand and produce texts of various types. CAE is recognised by the majority of universities in English speaking countries as proof of adequate language skills for courses taught and assessed in English as well as by employers who require knowledge of a foreign language. CAE is taken by more than 60 000 people each year in more than 60 countries. It is possible but not necessary for obtaining credit to take CAE at British Council. Student is allowed to enrol only into one CAE course during one semester.					
A0B04CAE3	Certificate of Advanced English CAE 3	Z	2		
The aim of the course is to prepare for Certificate of Advanced English - the second highest level Cambridge ESOL exam. The course CAE3 covers unit 9 - 12. Studying for CAE helps you to improve your language skills (reading, writing English in use, listening and speaking) and use them in a wide range of contexts.					
A0B04CAE4	Certificate of Advanced English 4	Z			
A0B04FCE1	FCE 1	Z	2		
The course is aimed for students, employees of the Faculty and the public whose knowledge of English corresponds to B1 level according to the European Language Frame. The course focuses on improving all language skills - writing, speaking, reading, listening, grammar and phonetics - and is submitted to the goal of obtaining the required skills needed for B2 ELF.					
A0B04FCE2	FCE 2	Z	2		
The course is aimed for students, employees of the Faculty and the public whose knowledge of English corresponds to B1 level according to the European Language Frame. The course focuses on improving all language skills - writing, speaking, reading, listening, grammar and phonetics - and is submitted to the goal of obtaining the required skills needed for B2 ELF.					
A0B04FCE4	FCE4	Z	2		
The course is aimed for students, employees of the Faculty and the public whose knowledge of English corresponds to B1 level according to the European Language Frame. The course focuses on improving all language skills - writing, speaking, reading, listening, grammar and phonetics - and is submitted to the goal of obtaining the required skills needed for B2 ELF.					

A0B04FCE3	FCE 3	Z	2
The course is aimed for students, employees of the Faculty and the public whose knowledge of English corresponds to B1 level according to the Common European Framework of Reference for Languages (CEFR). The course focuses on improving all language skills - writing, speaking, reading, listening, grammar and phonetics - and is submitted to the goal of obtaining the required skills needed for B2 CEFR.			
A0B04PZP	Preparation for stay in Germany	Z	2
A0B04RET	Rhetoric	Z	2
The objective of the subject is to master and improve skills necessary for successful presentation as well as enhancing the communicative ability of the prospective engineers and bachelors. This subject will enable the students to develop both spoken and written presentations, non verbal communication and remove the psychological barriers for public speaking so that the students can create a good image. The course "Retorika" provides an introduction to this subject.			
A0B04KR	Russian conversation	Z	2
A0B04KR2	Russian conversation 2	Z	2
A0B04R1	Russian language 1	Z	2
A0B04R2	Russian language 2	Z	2
A0B04R3	Russian language 3	Z	2
A0B04R4	Russian language 3	Z	2
A0B04KS1	Spanish conversation 1	Z	2
A0B04KS2	Spanish conversation 2	Z	2
A0B04S1	Spanish language 1	Z	2
A0B04S2	Spanish language 2	Z	2
A0B04S3	Spanish language 3	Z	2
A0B04S4	Spanish Language 4	Z	2
A0B04CA	Technical English for Pre-Intermediate	Z	2

Code of the group: MTV

Name of the group: Tělesná výchova

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
TVV	Physical education	Z	0	0+2	Z,L	v
TV-V1	Physical education	Z	1	0+2	Z,L	v
TVV0	Physical education	Z	0	0+2	Z,L	v
TVKLV	Physical Education Course	Z	0	7dní	L	v
TVKZV	Physical Education Course	Z	0	7dní	Z	v

Characteristics of the courses of this group of Study Plan: Code=MTV Name=Tělesná výchova

TVV	Physical education	Z	0
TV-V1	Physical education	Z	1
TVV0	Physical education	Z	0
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0

Code of the group: MKMEVOLPRE

Name of the group: Elective subjects

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách

<http://www.fel.cvut.cz/cz/education/volitelne-predmety.html>

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
A0M14AML	Aerodynamics and Mechanics of Flight	Z,ZK	4	2+2s	Z	v
A0M02AKA	Acoustic Applications Marek Brothánek, Ondřej Jiříček Ondřej Jiříček Ondřej Jiříček (Gar.)	KZ	4	2+2L	Z	v

A0M31ASN	Algorithms and Structures of Neurocomputers <i>Jana Tučková Jana Tučková Jana Tučková (Gar.)</i>	Z,ZK	5	2+2c	Z	v
A4M39APG	Algorithms of Computer Graphics <i>Jiří Žára, Jiří Bittner Jiří Žára Jiří Žára (Gar.)</i>	Z,ZK	6	2+2c	Z	v
A4M38AVS	Embedded Systems Application	Z,ZK	6	2P+2L	L	v
A0M31ACS	Architectures of Digital Systems	Z,ZK	4	2+2c	L	v
A4M36AOS	Service Oriented Architectures	Z,ZK	6	2+2c	Z	v
A4M33AU	Automatic Reasoning <i>Jan Jakubův, Jiří Vyskočil Jiří Vyskočil Olga Štěpánková (Gar.)</i>	Z,ZK	6	2+2c	L	v
A5M17BUP	Biological Effects of Electromagnetic Field <i>Ladislav Oppl, Jan Vrba Jan Vrba Jan Vrba (Gar.)</i>	KZ	4	2P+2L	L	v
A4M33BIA	Bio Inspired Algorithms	Z,ZK	6	2+2c	L	v
A1M16CTR	Controlling	Z,ZK	6	2+2s	Z	v
A0M37CIR	Implementation of the digital circuits in Radio <i>Petr Skalický Petr Skalický Petr Skalický (Gar.)</i>	Z,ZK	5	2+2L	L	v
A4M39DPG	Data Structures for Computer Graphics	Z,ZK	6	2+2s	L	v
A3M38DIT	Diagnostics and Testing	Z,ZK	7	3P+2L	L	v
A0M14DGP	Electric Drive Diagnostics	Z,ZK	5	2+2L	L	v
A4M33DZO	Digital image	Z,ZK	6	2+2c	Z	v
A1M16DES	Power Transport Systems	Z,ZK	5	2+2s	Z	v
A0M37DUP	Satellite navigation systems <i>Petr Kačmařík</i>	Z,ZK	4	2+2L	Z	v
A0M14DMP	Dynamics of mechanical parts of drives	Z,ZK	4	2+2s	Z	v
A1M16EKL	Ecology and economy <i>Jaroslav Knápek Jaroslav Knápek Jaroslav Knápek (Gar.)</i>	Z,ZK	5	3+1s	Z	v
A1M13EMP	Ecology of materials and processes	Z,ZK	5	2+2L	L	v
A1M16EUE	Economy of Energy Use	Z,ZK	5	2+2s	L	v
A1M15ENY	Power Plants <i>Zdeněk Müller, Stanislav Bouček, Jan Špetlík Jan Špetlík Jan Špetlík (Gar.)</i>	Z,ZK	5	2+2c	Z	v
A1M14PO2	Electric Drives and Traction 2	Z,ZK	5	2+2L	L	v
A1M14SP2	Electric Machinery and Apparatus 2	Z,ZK	5	2+2L	Z	v
A1M15EST	Electrical Light and Heat	Z,ZK	5	2+2c	Z	v
A0M15EZS	Electrical Sources and Systems	Z,ZK	5	2+2s	Z	v
A1M13EZF	Electrochemical Sources and Photovoltaics <i>Tomáš Reichl, Vítězslav Benda, Pavel Hrzina, Ladislava Černá Vítězslav Benda (Gar.)</i>	Z,ZK	5	2+2L	Z	v
A0M31EOF	Electronic Circuits and Filters	Z,ZK	5	2+2c	L	v
A0M34EZS	Electronic Security Systems <i>Jan Novák, Miroslav Husák, Tomáš Teplý Tomáš Vítek Miroslav Husák (Gar.)</i>	Z,ZK	5	2P+2L	Z	v
A1M14ESZ	Power Machine Equipment	Z,ZK	4	2+2s	Z	v
A0M33EOA	Evolutionary Optimization Algorithms <i>Jiří Kubalík, Petr Pošík Petr Pošík Petr Pošík (Gar.)</i>	Z,ZK	6	2+2c	Z	v
A1M16FIM	Financial Management	Z,ZK	6	2+2c	L	v
A1M16FIU	Financial Accounting	Z,ZK	5	2+2s	Z	v
A0M02FPL	Solid State Physics <i>Vítězslav Kříha, Martin Záček, Jan Pichal Vítězslav Kříha Vítězslav Kříha (Gar.)</i>	Z,ZK	5	2+2s	Z	v
A0M02FEN	Physics for Electroenergetics <i>Jakub Cikhardt, Pavel Kubeš Pavel Kubeš Pavel Kubeš (Gar.)</i>	Z,ZK	4	2+2s	Z	v
A4M34ISC	Systems on Chip <i>Jiří Jakovenko, Vladimír Janiček Jiří Jakovenko Jiří Jakovenko (Gar.)</i>	Z,ZK	6	2P+2C	L	v
A3M33IRO	Intelligent robotics	Z,ZK	7	3+2L	L	v
A1M13JAS	Quality and Reliability	Z,ZK	5	2+2c	Z	v
A4M35KO	Combinatorial Optimization	Z,ZK	6	3+2c	L	v
A4M38KRP	Computer Interfaces	Z,ZK	6	2P+2C	Z	v
A0M14KSP	Drive Communication Systems	Z,ZK	5	2+2c	L	v
A0M13KTM	Construction and Technology of Microcomputers	Z,ZK	5	2+2L	Z	v
AE2M34LPD	Low Power Design and Test of Circuits and Systems	Z,ZK	5	3P+2C	L	v
A0M38MAP	Magnetic Elements and Magnetic Measurements	Z,ZK	5	2+2L	Z	v
A1M16MES	Management and Economics of Power Systems	Z,ZK	6	2+2s	Z	v
A1M16MAV	Production Management	Z,ZK	5	2+2s	L	v

A1M16MEE	Management of Power Production	Z,ZK	5	2+2s	L	v
A1M16MAR	Marketing	Z,ZK	5	2+2s	Z	v
A0X36MOOC	Massive Open Online Course <i>David Šišlák David Šišlák David Šišlák (Gar.)</i>	Z	2	1+0	Z,L	v
A1M01MPE	Mathematics for Economy	Z,ZK	6	4+2	Z	v
A3M01MKI	Mathematics for Cybernetics <i>Jan Hamhalter, Veronika Sobotíková, Martin Bohata Jan Hamhalter Jan Hamhalter (Gar.)</i>	Z,ZK	8	4+2	Z	v
A1M01MPS	Probability and Statistics	Z,ZK	8	4+2	Z	v
A4M33MPV	Computer Vision Methods	Z,ZK	6	2+2c	L	v
A0M38MET	Metrology	Z,ZK	5	2+2L	Z	v
A3M33MKR	Mobile and Collective Robotics	Z,ZK	6	2+2L	Z	v
A0M14MDS	Simulation of dynamic systems	Z,ZK	4	2+2c	L	v
A0M13MKV	Advanced Components of Power Electronic <i>Vítězslav Benda</i>	Z,ZK	5	2+2L	L	v
A0M37MOT	Advanced areas in image and video technology <i>Karel Fliegel</i>	KZ	5	2+2L	L	v
A3M38MSZ	Modern Sensors and Signal Processing	Z,ZK	6	2P+2L	L	v
A4M36MAS	Multiagent Systems	Z,ZK	6	2+2c	Z	v
A4M39MMA	Multimedia and Computer Animation	Z,ZK	6	2+2L	Z	v
A0M17NKA	Antenna Design and Technology <i>Miloš Mazánek, Milan Polívka, Pavel Hazdra, Milan Švanda Milan Švanda Milan Polívka (Gar.)</i>	Z,ZK	5	2+2L	Z	v
A4M33NMS	Design and Modeling of Software Systems	Z,ZK	6	2+2c	Z	v
A0M34NFO	Design of Photonic Circuits <i>Vítězslav Jeřábek, Václav Prajzler, Zdeněk Burian Vítězslav Jeřábek Vítězslav Jeřábek (Gar.)</i>	Z,ZK	4	2P+2L	L	v
A0M14KOP	Electric Drive Component Design	Z,ZK	5	2+2L	Z	v
A0M34NNZ	Design of Power Supplies for Electronics <i>Jan Novák, Lubor Jirásek Jan Novák Lubor Jirásek (Gar.)</i>	Z,ZK	5	2P+2L	L	v
A0M34NSV	VLSI System Design <i>Pavel Hazdra Pavel Hazdra Pavel Hazdra (Gar.)</i>	Z,ZK	4	2P+2L	Z	v
A4M39NUR	User Interface Design	Z,ZK	6	2+2s	Z	v
A3M35NES	Nonlinear Systems and Chaos	Z,ZK	6	3+1c	L	v
A0M38OSE	Image Sensors <i>Jan Fischer</i>	Z,ZK	5	2P+2L	Z	v
A3M35OFD	Estimation, filtering and detection	Z,ZK	6	3+1c	Z	v
A0M33OSW	Ontologies and Semantic Web <i>Petr Křemen</i>	KZ	4	2+2c	Z	v
AE0M33OSW	Ontologies and Semantic Web <i>Petr Křemen</i>	KZ	4	2+2c	Z	v
A4M35OSP	Open-source programming	Z,ZK	6	2+2c	L	v
A1M16OVY	Operations Research	Z,ZK	5	2+2c	L	v
A3M35ORR	Optimal and robust control	Z,ZK	6	3+1c	L	v
A4M36PAH	Planning and game playing	Z,ZK	6	2+2c	L	v
A1M16LOG	Business Logistics	Z,ZK	5	2+2s	Z	v
A4M33PAL	Advanced algorithms <i>Marko Genyk-Berezovskyj Marko Genyk-Berezovskyj (Gar.)</i>	Z,ZK	6	2+2c	Z	v
A3M33PRO	Advanced robotics	Z,ZK	6	2+2L	Z	v
A4M36PAP	Advanced Computer Architectures	Z,ZK	6	2+2c	Z	v
A4M33RZN	Advanced Methods for Knowledge Representation <i>Petr Křemen, Jiří Kléma, Radomír Černoch Petr Křemen Jiří Kléma (Gar.)</i>	Z,ZK	6	2+2c	Z	v
A3M99PTO	Team Work	KZ	6	1+3c	L	v
A3M35PSR	Real-Time Systems Programming	Z,ZK	6	2+2c	Z	v
A1M16PMG	Project Management	KZ	5	2+2s	L	v
A0M32PRD	Data Communication Means <i>Tomáš Zeman Tomáš Zeman (Gar.)</i>	Z,ZK	5	2+2L	Z	v
A0M13PRE	Industrial electronics	Z,ZK	5	2+2L	Z	v
A0M35PII	Industrial Informatics and Internet	Z,ZK	6	2+2c	Z	v
A0M33PIS	Industrial Information Systems	Z,ZK	6	2+2c	L	v
A1M15PRE	Transmission and Distribution of Electricity	Z,ZK	5	2+2s	L	v
A1M16RES	Development of Energy Systems	Z,ZK	5	2+2s	Z	v

A3M35RIS	Control Systems	Z,ZK	6	2+2L	Z	v
A1M14RPO	Electric Drive Control	Z,ZK	5	2+2L	L	v
A1M15RES	Control of Power Systems <i>Jan Špetlík</i>	Z,ZK	5	2+2c	L	v
A1M16JAK	Quality management	Z,ZK	5	2+2s	Z	v
A3M38SPD	Data Acquisition and Transfer	Z,ZK	6	2P+2L	Z	v
A1M14SOP	Simulation and Optimization in Drives	Z,ZK	5	2+2L	Z	v
A1M13SVS	Simulation of Production Systems	Z,ZK	5	2+2c	Z	v
A0M15SZS	Reliability and Security of Power Systems	Z,ZK	5	2+2s	L	v
A1M16STA	Statistical methods in economics	Z,ZK	5	2+2c	L	v
A1M14SSE	Machinery structures of power plants	Z,ZK	4	2+2s	Z	v
A4M33SAD	Machine Learning and Data Analysis <i>Jiří Kléma, Filip Železný Filip Železný Filip Železný (Gar.)</i>	Z,ZK	6	2+2c	Z	v
A0M37SEK	Synchronization and equalization in digital communications <i>Jan Sýkora Jan Sýkora Jan Sýkora (Gar.)</i>	Z,ZK	4	3+1s	Z	v
A1M16SIR	System Analysis and Decision Making	Z,ZK	5	2+2c	Z	v
A1M15TVN	High Voltage Engineering	Z,ZK	5	2+2L	L	v
A1M13TPR	Technological Project Planning	Z,ZK	5	2+2s	L	v
A0M13TKS	Technology of Cables and Optical waveguides	Z,ZK	5	2+2L	L	v
A1M32TSY	Telecommunication Systems	Z,ZK	4	2+2L	Z	v
A4M33TZ	Theoretical foundations of computer vision, graphics, and interaction	Z,ZK	6	2+2c	L	v
A4M01TAL	Theory of Algorithms <i>Marie Demlová, Natalie Žukovec Jan Hamhalter Marie Demlová (Gar.)</i>	Z,ZK	6	3+1	L	v
A3M35TDS	Theory of Dynamical Systems	Z,ZK	8	4+2c	Z	v
A4M33TVS	Software Verification and Testing <i>Jiří Vyskočil</i>	Z,ZK	6	2+2c	Z	v
A0M17TMS	Perspectives in Millimetre and Submillimetre Technology	Z,ZK	5	2+2L	Z	v
A3M33UI	Artificial Intelligence <i>Petr Pošík</i>	Z,ZK	6	2+2c	L	v
A3M38VBM	Videometry and Contactless Measurement <i>Jan Fischer Jan Fischer Jan Fischer (Gar.)</i>	Z,ZK	6	2P+2L	L	v
A3M38VIP	Virtual Instruments	Z,ZK	6	2P+2C	Z	v
A4M39VIZ	Visualization	Z,ZK	6	2+2c	L	v
A1M14VE2	Power Electronics 2	Z,ZK	5	2+2L	Z	v
A4M39VG	Computational Geometry <i>Jiří Žára</i>	Z,ZK	6	2+2s	Z	v
A1M13VEZ	Manufacturing of Electronic Equipment	Z,ZK	5	2+2L	Z	v
A1M13VES	Manufacturing of Electrical Components	KZ	4	2+2L	Z	v
A1M16VEN	Power and Heat Production	KZ	5	2+2s	Z	v
A0M31ZLE	Basics of Medical Electronics <i>Jan Havlík Jan Havlík Jan Havlík (Gar.)</i>	Z,ZK	4	2+2L	Z	v
A3M38ZDS	Analog Signal Processing and Digitalization	Z,ZK	6	2P+2L	Z	v
A0M37ZV2	Audio Technology 2 <i>František Rund</i>	Z,ZK	4	2+2L	Z	v
A0M02ZIP	Environmental Science <i>Rudolf Bálek Rudolf Bálek Rudolf Bálek (Gar.)</i>	ZK	2	2+0s	Z	v
A4M33TDV	3D Computer Vision	Z,ZK	6	2+2c	Z	v

Characteristics of the courses of this group of Study Plan: Code=MKMEVOLPRE Name=Elective subjects

A0M14AML	Aerodynamics and Mechanics of Flight Subject clarifies substantial relations and effects of force influence of flowing fluid on surface of airfoil, wing or complete airplane at subsonic or supersonic airspeeds. Further, subject deals with basic tasks of airplane performance and necessary conditions for airplane stability and control.	Z,ZK	4
A0M02AKA	Acoustic Applications Lecture summarize applications in physical acoustics, room and building acoustics, environmental acoustics, noise and vibration control, physiological acoustics, diagnostics, and ultrasound.	KZ	4
A0M31ASN	Algorithms and Structures of Neurocomputers Information about the basic principles and possibility of the application of the neural informative technology for the signal processing are the main topic. The lectures are devoted to the introduction into the artificial neural networks (NN) theory and applications, to the choice and the optimisation of the structures, the choice of the data, and to the solutions of the classification. The neural network applications at the speech and image processing are investigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the SOM are described. The applications are o focused to EEG and ECG processing, also to possibilities of applications ANN at physiotherapy,	Z,ZK	5
A4M39APG	Algorithms of Computer Graphics In this course you will get acquainted with basic problems and their solutions in computer graphics. The main topic of the course are graphics primitives in 2D and 3D for modeling and rendering, color models, image representations, and basic photorealistic rendering algorithms.	Z,ZK	6

A4M38AVS	Embedded Systems Application	Z,ZK	6
This course presents applications of embedded systems and their specifics. It is expected that the students have had a programming course, and thus the course is more oriented on explaining and describing the blocks and functions of embedded systems and their use in signal processing, rather than writing code. After completing this course, students should have an overview of usability and power of available processors, and their peripherals, on the basis of which, they should be able to independently design embedded systems for a wide spectrum of applications.			
A0M31ACS	Architectures of Digital Systems	Z,ZK	4
Types of processor architectures, singlechip and multichip computers. Processor structures for real-time digital signal processing. Data flow driven computers. Artificial neural nets. Structures designed in accordance with procedures of data processing, architectural considerations. Design of circuits for digital signal processing and arithmetic operations, design of processors and peripherals, low-power design techniques. Data synchronization and communication between asynchronous clock-domains			
A4M36AOS	Service Oriented Architectures	Z,ZK	6
The lecture focuses on service-oriented computing (SOC) and service-oriented architecture (SOA). Basic concepts of SOC will be explained on the service level (service description, discovery and invocation) and process level (business process formalization, service composition, transaction mechanisms) with respect to SOC utilization for flexible business applications implementation in (semi-)open environment (intra- i inter-enterprise). Besides basic web-services specifications and technologies (SOAP, WSDL, UDDI, BPEL) the up-to-date technologies for semantic web-services will be introduced. Great emphasis will be put on representation and modeling formalisms (RDF, RDFS, OWL). Open environment operation aspects will be also presented (reputation, trust, quality-of-service, privacy). The goal of the course is to bring general overview, but particular SOA platforms and tools (Sun Glassfish, JBoss) will be also introduced including comparison to older distributed systems architectures (CORBA, DCOM) and related domain of multi-agent systems. The design methodology, implementation, and deployment will be explained with relation to existing business processes and organizational structures.			
A4M33AU	Automatic Reasoning	Z,ZK	6
Theorem proving is no more restricted to mathematics, but it is ever more often used in situations, when one needs to make sure that the suggested procedure meets the initial requirements it is used in deductive databases as well as for verification of SW or HW components. The process of proof construction has to be automated for that purpose. The course reviews current systems of 1st order theorem proving and their practical applications. There are explained underlying theoretical principles (model checking, resolution, tableaux) together with their practical and theoretical constraints. Special attention is devoted to gaining experience in choosing the best tool to solve a specific problem, in identification of mistakes in input or in strengthening the obtained results.			
A5M17BUP	Biological Effects of Electromagnetic Field	KZ	4
Biophysical Aspects of Electromagnetic Fields (EF) coupling of Various Biological Systems (BS). Interaction of EF with BS - overview. Mechanism of Interaction and Biological Effects. Experimental Results and Hypotheses of Biological Effects of Static and Stationary Electrical, Magnetic and Nonstationary Fields. Mathematical Solution of Interaction. EF generated by living Organism. Applications of EF in Medicine. Hygienic Standards.			
A4M33BIA	Bio Inspired Algorithms	Z,ZK	6
The students will learn some of the unconventional methods of computational intelligence aimed at solving complex tasks of classification, modeling, clustering, search and optimization. Bio-inspired algorithms take advantage of analogies to various phenomena in the nature and society. The main topics of the subject are artificial neural networks and evolutionary algorithms.			
A1M16CTR	Controlling	Z,ZK	6
Course primary objective is in introducing the Management Control (Controlling) as the up-to-date approach to management of the organization (enterprise, institution). To explain its changing role in management on its development in past decades from functional form, over reporting period, to integral concept of the management control of the organization. Both points of view - the recent theoretical bibliography and context of advanced practice are considered. The course focuses on key linkages among functional areas, key processes and activities in management control system. The course deals with managerial methods and other managerial tools to be applied in management of single entities of management control system and in their interrelated actions.			
A0M37CIR	Implementation of the digital circuits in Radio	Z,ZK	5
The course is base for student, which want practically designed circuits of the digital signal processing with the signal processors and specialised circuits. Attention is concentration to realisation of the modulators and circuit of the numerical conversion of the signal, algorithms coding/decoding, which contains in the communication chain. Dominantly is concentration to effective realization with minimal computing power.			
A4M39DPG	Data Structures for Computer Graphics	Z,ZK	6
This course provides you with the fundamentals of data structures commonly used in computer graphics. In contrast to standard binary search trees used in one dimension, the presented theory focuses on multidimensional data used to describe 3D scenes. In addition to the theory, the course emphasizes individual and team projects, where the importance and advantages of multidimensional data are demonstrated on practical examples. The students will gain practical experience through their own individual projects.			
A3M38DIT	Diagnostics and Testing	Z,ZK	7
The course introduces the fundamentals of the fault-diagnosis and testing systems, machine condition monitoring, vibrodiagnostics and advanced signal processing methods, non-destructive testing and testing of analog and digital circuits. In laboratory will be demonstrated selected diagnostic tools, and solved an individual project related to diagnostics and/or testing.			
A0M14DGP	Electric Drive Diagnostics	Z,ZK	5
Power electronics control computer structure, digital signal processor and ALU added features for fast real time calculations. Interrupt system and DMA system, analog signal measurement, fast impulse signal measurement, fast impulse generation support, inter-computer communication, system and power management, programming languages for power systems software development, programming techniques, software development tools (simulators, emulators, monitors), input signal conditioning circuitry, conversion from analog signals to digital processing, time sampling, amplitude quantization, power electronics control block design and implementation, difference equations and control algorithms, fixed and floating point calculations, debugging methods, program parametrization, guides and rules for implementation and application of power system control computers. Real time operating system, scheduler, dispatcher and another features and guides for application			
A4M33DZO	Digital image	Z,ZK	6
First, the subject teaches how to process two-dimensional image as a signal without interpretation. Image acquisition, linear and nonlinear preprocessing methods and image compression will be studied. Second, image segmentation and registration methods will be taught. Studied topics will be practised on practical examples in order to obtain also practical skills.			
A1M16DES	Power Transport Systems	Z,ZK	5
Economical aspects of energy transport. Electricity transportation through lines. Heat, gas and oil lines. There are ment also universal transport systems as railway, roads and ships with considering of energy transport. After technical introduction it is dealt with problems of economical design of transport lines and economical operation			
A0M37DUP	Satellite navigation systems	Z,ZK	4
Existing, future and past radio satellite navigation systems. Course is addressed to students without knowledge of radio engineering. Attention is paid to measurements and practical tasks in laboratory and to experimental receiver programming.			
A0M14DMP	Dynamics of mechanical parts of drives	Z,ZK	4
Subject is oriented to mathematical description and solving of dynamic processes in mechanic parts of machines and drives. Dynamics of rotational and general plane motion, effects of inertial forces on body, balancing of rotors. Vector and analytic methods of composing equations of motion of systems and their solving. Vibration in machine set and vibration effects reducing. Stress and deformation in rotating parts, critical speed of rotors. Drives characteristics and transient events in systems with driving aggregates .			
A1M16EKL	Ecology and economy	Z,ZK	5
Development of environmental protection. Sustainable development. Global environmental problems and their aspects. Greenhouse effect and climate changes. Fossil fuels, nuclear fuel cycle and environmental impacts. Support schemes for renewable energy sources utilization. Economic effectiveness of renewable energy sources projects. Regulatory and economic instruments for economic activities regulation. Externalities. Environmental indicators.			

A1M13EMP	Ecology of materials and processes	Z,ZK	5
Electrical Technology from the perspective of ecology. Environmental assessment of the various types of surface protection. Environmental aspects of protective systems used in electronics. Environmental impacts of electrical production. Ekodesign proposal of the electrical product. Principles of the proposal product for a difficult operating environment. Disposal of electrical waste.			
A1M16EUE	Economy of Energy Use	Z,ZK	5
Organization and energy management of company, buildings or energy systems. Energy need and consumption, energy balance. Energy characterization of aggregate, secondary energy sources. Energy audit and feasibility study, optimization of energy management of energy systems. Prices and tariffs, economy and financial analysis.			
A1M15ENY	Power Plants	Z,ZK	5
The subject introduces power plants of all kinds dimensioning and functions. It describes diagrams topologies, operational modes, control and safety problems solutions. It models dynamics and control of main part in all power plants types. It evaluates and describes control qualities and programmes.			
A1M14PO2	Electric Drives and Traction 2	Z,ZK	5
Electro mobiles and hybrid cars. Tire train and rolling resistance. Adhesion. Traction power. Locomotive traction power calculation for defined train load and track. Mass transportation vehicles. Tramway with resistive control, pulse control and induction motors. Tramway power-electronic converters. Trolley-busses. Metro. Electric locomotives - various designs. Locomotive power-converters. DC, AC and multi-system locomotives. AC motor locomotives. Diesel-electric locomotives			
A1M14SP2	Electric Machinery and Apparatus 2	Z,ZK	5
Contacts and semiconductor switching apparatus in LV networks. Basic topology of 3-phase switches and power load of its components. Power switches and systems with progressive semiconductor devices and its control circuits. Protective circuits of semiconductor switching devices. Electric apparatus testing. Continue. Fundamentals of general theory of electric machine. Magnetic field. Fundamentals of commutation. Transformer, efficiency, volt drop. Transient phenomena - switch to the network, cut-off. Mathematical model of synchronous and induction machine. Rotating magnetic field. Induction machine, starting and speed control. Magnetic field harmonics and their influence. Single-phase induction motor. Operation of the synchronous machine on the network. Torque, stability, overload capacity. Transient phenomena, cut-off			
A1M15EST	Electrical Light and Heat	Z,ZK	5
The aim of the first part of the course is to make students acquainted with most frequent applications of optical radiation, modern photometric and colorimetric devices used in practice, fundamentals of light control and design of dynamic lighting including new trends in light sources and luminaire progress. The aim of the second part of the course is to become students acquainted with heat transfer laws, heat pumps and problems of global optimization on electrical power engineering.			
A0M15EZS	Electrical Sources and Systems	Z,ZK	5
The subject is focused on the task of power quality, its operational criteria and improvement possibilities. There are also discussed specific tasks of dispersed generation and electrical systems. The student is then informed about basic electrical energy renewable sources and their connection possibilities to the system.			
A1M13EZF	Electrochemical Sources and Photovoltaics	Z,ZK	5
Photovoltaic sources. Operating principles, characteristics. Solar modules, construction and technology. Basic types of photovoltaic systems and their applications. Electrochemical sources of the electric power - overview. Primary cells and accumulators. Methods of accumulator charging. Sources for electrochemical production processes and their control. Automotive applications. Environmental aspects of the electrochemical sources and production processes.			
A0M31EOF	Electronic Circuits and Filters	Z,ZK	5
Subject deepens and consolidates knowledge in the field of analog electronic circuits and frequency-selection filters. Analytical procedures are the gist that lead from complete models of analog integrated circuit structures, through the simplification, to a deeper understanding of their characteristic. Design fundamental is obtained by the analysis of the dominant influences to the circuit activities. Design and realizations of analog filters is introduced in the next part.			
A0M34EZS	Electronic Security Systems	Z,ZK	5
The subject describes the system design, electronic solutions, conception characteristics, reliability and its increasing of electronic security and safety systems. It reports solutions of electronic sensor systems and methods of security system design, usage of modern electronic components and microprocessors. It offers practical applications suitable for safety systems of houses, cars, industry companies.			
A1M14ESZ	Power Machine Equipment	Z,ZK	4
Analysis of basic functions and operational accidents for power engineering. Quantitative and qualitative balance energy of machine equipment. Analysis of influence breakdowns of machine equipment, modes of regulation power output of power machine equipment. Operating optimisation. Operation properties of power machine equipment of power plant.			
A0M33EOA	Evolutionary Optimization Algorithms	Z,ZK	6
The course aims at issues related to the application of evolutionary algorithms in practice and at the methods used to solve them. Evolutionary algorithms are optimization metaheuristics that use analogies with natural evolution to solve complex optimization tasks. The course builds on and extends knowledge from the course Bio-inspired algorithms. In the seminar and lab lectures, the students will get hands-on tutorials and will be obliged to implement their own evolutionary algorithm to solve an optimization task as part of their project.			
A1M16FIM	Financial Management	Z,ZK	6
Principles of finance, present value and alternative cost of capital, net present value, valuation of bonds and stocks, investment decision and net present value, risk and alternative cost of capital, risk and return, lease or buy, taxes, inflation and return, financial and real options, option valuation and application, hedging, short term finance, cash flow management.			
A1M16FIU	Financial Accounting	Z,ZK	5
Principles of accounting. Assets, inventory and financial investment book keeping. Debt and equity capital. Cost, revenues and profit. Tax system and accounting. Balance sheet, profit and loss account. Cash flow statement. Analysis of company's financial position. International accounting standards. Auditing, consolidated statements.			
A0M02FPL	Solid State Physics	Z,ZK	5
Elementary physics of solids for students of electrotechnology. Description and classification of solids. Thermal properties of solids. Types of bonds in solids. Real crystals, their defects and surfaces. Electrons in solids, the band structure, electrons and holes. Metals, semiconductors, insulators. Transport phenomena, generation and recombination of minority carriers. Magnetism, magnetic properties of solids. Optical phenomena in solids, luminescence, stimulated emission.			
A0M02FEN	Physics for Electroenergetics	Z,ZK	4
Lessons contain selected parts of physics for students of electric power engineering: Physical principles of gas discharges - glow, arc, spark and corona discharges and their applications. The students become acquainted with methods for nuclear fission and fusion energy generation. The introduction to structural properties of matter and its thermal, electrical and magnetic properties. A part of the course is two excursions in Laboratories of Czech Academy of Sciences.			
A4M34ISC	Systems on Chip	Z,ZK	6
Main responsibilities of integrated circuits designer; design abstraction levels - Y chart. Specification designation, feasibility study, criteria for technology and design kits selection. Analogue and digital integrated systems design and simulation methodologies. Main features of application specific ICs - full custom design, gate arrays, standard cells, programmable array logic. Design aspects mobile and low power systems. Hardware Description languages (HDL). Logic and physical synthesis. Front End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenche construction and verification.			
A3M33IRO	Intelligent robotics	Z,ZK	7
The subject teaches principles allowing to build robots perceiving surrounding world and activities in it including the abilities to modify it. Various architectures of robots with cognitive abilities and their realizations will be studied. Students will experiment with robots in practical assignments. Studied material is applicable more widely while building intelligent machines.			
A1M13JAS	Quality and Reliability	Z,ZK	5
Terminology and definitions from the area of quality and reliability and their control, philosophy of quality, systems of quality control in the world. Reliability as a part of quality. Basic definitions from the area of reliability, basic distributions used in reliability and their basic characteristics. Back-up using a warm and cold standby, types of warm and cold standbys. Reliability of components and systems, calculation of reliability using composition and decomposition. and using a method of a list. Basic statistical methods and tools joined with quality control, managerial tools for quality control. Techniques FMEA and QFFD, house of quality. Capability of a process. Taguchi loss function. Audits. Statistical inspection.			

A4M35KO	Combinatorial Optimization	Z,ZK	6
The goal is to show the problems and algorithms of combinatorial optimization (often called discrete optimization; there is a strong overlap with the term operations research). Following the courses on linear algebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programming, heuristics, approximation algorithms and state space search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, planning of human resources, scheduling in production lines, message routing, scheduling in parallel computers.			
A4M38KRP	Computer Interfaces	Z,ZK	6
Students are acquainted with common computer interfaces and design of peripherals. Selected PC interfaces (USB, PCI, PCI Express, IEEE1394, ExpressCard), metallic and wireless networks (IEEE802.x standards) and industrial interfaces (EIA-485, EIA-232, CAN) are explained in detail. Project-oriented laboratories are focused on design and implementation of selected communication interface.			
A0M14KSP	Drive Communication Systems	Z,ZK	5
Electric drive distributed control system - system view, serial communication primer, computer network topology, point-to-point, bus, loop, bus access methods, master-slave, peer-to-peer, CSMA/CD, CSMA/CR, addressed transmission, broadcasting, baud-rate, synchronous and asynchronous transmission, channel bandwidth, transmission synchronization, bit and character stuffing/destuffing, modulation, bit encoding, frame, transfer protocol, protocol overhead, error detection, acknowledged and unacknowledged communication, transmission media and environment , OSI model and other layered models, overview of industrial communication technologies utilized in drives and their features, UART, USART, Profibus, HDLC, SDLC, Bitbus, LIN bus, CAN bus, CANOpen, LonWorks, EIB/KNX, Ethernet, TCN-MVB/WTB, Microwire, SPI, I2C, USB. Communication services programming and their implementation inside overall control computer software architecture. Communication development tools, communication services debugging, monitoring and logging. Noise resistance, cabling, connectors			
A0M13KTM	Construction and Technology of Microcomputers	Z,ZK	5
Microcomputers for control of technological systems, architecture, timing, instructions, basic parts, embedded microprocessors, input/output. Supplementary circuits. Control of technological systems. Microprocessor development system, design of microcomputer and application. Industrial standards. Design of microcomputers - modular and built-in systems, industrial PC. SCADA systems.			
AE2M34LPD	Low Power Design and Test of Circuits and Systems	Z,ZK	5
This course covers advanced VLSI design and test techniques for low power circuits. Topics covered include aspects of the design of low voltage and low power circuits including process technology, device modeling, CMOS circuit design, memory circuits and subsystem design. Course also covers aspects of testing and reliability of low power circuits and systems. Various types of defects observed in practical designs will be discussed. Focus will be also on on- and off-chip techniques for defect detection, failure analysis and diagnosis. This will be a research- oriented course based on team projects.			
A0M38MAP	Magnetic Elements and Magnetic Measurements	Z,ZK	5
Measurement of magnetic field, NMR. Typical soft and hard magnetic materials. Measurement of properties of soft and hard magnetic materials. DC and AC magnetised circuits, circuits with permanent magnet. Current and voltage instrument transformers, current comparators. Sources of magnetic field. Magnetic shielding.			
A1M16MES	Management and Economics of Power Systems	Z,ZK	6
This course will give an overview of the various aspects of power supply with special emphasis on power management. The course characterises energy costs and marginal costs for determination of prices and tariffs. Energy market principles and operational decision making are integral parts of the course as well.			
A1M16MAV	Production Management	Z,ZK	5
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.			
A1M16MEE	Management of Power Production	Z,ZK	5
Power plants and mining industry management and economics, energy balances and costs calculations of power production - electricity, steam, hot water, coal, liquid fuels, gas, economic loading of power plants, cost analysis			
A1M16MAR	Marketing	Z,ZK	5
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. Marketing-mix. Product and service policy, pricing and contraction policy, communication, distribution. Controlling and audit.			
A0X36MOOC	Massive Open Online Course	Z	2
See https://cw.fel.cvut.cz/b172/courses/a0x36mooc/start for additional details.			
A1M01MPE	Mathematics for Economy	Z,ZK	6
Aim of this subject is to give the basic informations about probability, mathematical statistics and Markov chains and to show their applications, mainly in insurance mathematics. At the end of the course, bases of cluster analysis will be shown.			
A3M01MKI	Mathematics for Cybernetics	Z,ZK	8
The goal is to explain basic principles of complex analysis and its applications. Fourier transform, Laplace transform and Z-transform are treated in complex field. Finally random processes (stacinary, markovian, spectral density) are treated.			
A1M01MPS	Probability and Statistics	Z,ZK	8
The course covers probability and basic statistics. First classical probability is introduced, then theory of random variables is developed including examples of the most important types of discrete and continuous distributions. Next chapters contain moment generating functions and moments of random variables, expectation and variance, conditional distributions and correlation and independence of random variables. Statistical methods for point estimates and confidence intervals are investigated.			
A4M33MPV	Computer Vision Methods	Z,ZK	6
The course covers selected computer vision problems: search for correspondences between images via interest point detection, description and matching, image stitching, detection, recognition and segmentation of objects in images and videos, image retrieval from large databases and tracking of objects in video sequences.			
A0M38MET	Metrology	Z,ZK	5
After a brief description of the role of the most important domestic and foreign metrological organizations and institutions, explanation is focused on units of measurable quantities and possibilities of their definition, realization, conservation and reproduction by means of measurement standards. After that, attention is paid to measurement methods and techniques for evaluating and increasing measurement accuracy. Facilities and methods applicable to precision measurements of both active and passive electrical quantities are described.			
A3M33MKR	Mobile and Collective Robotics	Z,ZK	6
The course introduces basic mobile robot structure design together with control methods aimed to achieve autonomous and collective behaviors for robots. Methods and tool s for data acquisition and processing are presented herein with the overall goal to resolve the task of autonomous navigation for mobile robots comprising the tasks of sensor fusion, environmental modeling including Simultaneous Localization And Mapping (SLAM) approaches. Besides sensor-processing related tasks, methods for robot trajectory planning will be introduced. The central topic of the course stands in specific usage of the afore methods capable of execution with groups of robots and taking the advantage of their cooperation and coordination in groups. Labs and seminars are organized in a form of an Open Laboratory whereas the students will resolve the given problem in simulated environments as well as with a real robot HW.			
A0M14MDS	Simulation of dynamic systems	Z,ZK	4
Aim of subject is simulation of nonlinear problems from fields of dynamics of rigid bodies, fluid mechanics, aerodynamics, thermodynamics and their mutual combinations. In scope of subject is given overview of substantial derivations, relations, formulas and numeric methods. Seminars are focused on assembling of numeric models in program Matlab-Simulink			
A0M13MKV	Advanced Components of Power Electronic	Z,ZK	5
Power semiconductor device (diodes, BJTs, thyristors, MOSFETs and IGBTs) and integraed structures (modules). Structures, function, characteristics and parameters, conditions for reliable operation. Connection of devices in parallel and in series. Operating reliability of power components and equipments.			

A0M37MOT	Advanced areas in image and video technology	KZ	5
This course presents the state-of-the-art techniques for digital image and video technology. These techniques and their applications cover almost all areas of technical professions dealing with human interaction. The content of lectures is being updated rapidly and continuously according to a remarkable progress in this field. The course deals with the principal functional blocks of mentioned systems both hardware and software implemented.			
A3M38MSZ	Modern Sensors and Signal Processing	Z,ZK	6
The course is aimed to broaden the sensors basics by topics necessary for design of sensors and sensor systems. Prospective sensor types are covered as well as methods of the processing of the sensor signal. Sensors and sensor systems are shown in applications and by case design studies. The labs are concentrated to the complex measurement of the sensor parameters and to FEM modeling and its experimental verification. Optical sensors and their applications are covered in detail by following course "Videometry".			
A4M36MAS	Multiagent Systems	Z,ZK	6
This course provides foundations of multi-agent systems and agent technologies. It provides a formal model of an agent, the concept of reactive, deliberative and deductive agent, BDI architecture, basics of inter agent communication and coordination. Introduction to distributed decision making and game theory will be also provided.			
A4M39MMA	Multimedia and Computer Animation	Z,ZK	6
The course is focused on methods often applied in the area of computer animation. Students will get an overview of algorithms and methods solving typical problems of 3D animation (inverse kinematics, animation of human body, dynamics, etc.). Part of the course is devoted to principles used during creative work with sound. The last part of lectures will give information about methods and technologies used in movie production (MOCAP, stereoscopy, visual effects).			
A0M17NKA	Antenna Design and Technology	Z,ZK	5
Basics of practical design of antennas for specific frequency bands, modeling, design and construction of antenna and antenna systems. Antenna measurement methods, practical measurements in antenna laboratory. Modeling on professional software tools for antenna design.			
A4M33NMS	Design and Modeling of Software Systems	Z,ZK	6
The subject introduces to the design process of a software system from requirements gathering to a detailed object-oriented design. It is based on existing development methodologies, especially object-oriented, and the UML language will be used as a dominant formalism. The subject is oriented mainly on reliability analysis and formal and informal methods to reduce error rate in design phases.			
A0M34NFO	Design of Photonic Circuits	Z,ZK	4
Students obtain practical skills with design of photonics devices and their applications in photonics systems. Students acquaint with BMP, FULL WAVE and TCAD programs. These software allowed design optics structures and devices using for controlling and distribution optical signals. Software TCAD is used for design of injection optical sources. Optoelectronic integrated circuits will be design by WINMIDE and ORCAD programmes.			
A0M14KOP	Electric Drive Component Design	Z,ZK	5
Theoretical principles and pragmatic procedures in main types electric drives for transtort, automatisaton and manipulating technics design. Selection, dimensionning and realisation of drives components: power supply, switching devices, protection, semiconductor converter, electric motor. Project, verification of dimensionning and testing of drive components, realisation of selected part on model drive, experimental parameters examination. Semestrial project optionally fixed on theoterial design, realisation or experimental parameters verification			
A0M34NNZ	Design of Power Supplies for Electronics	Z,ZK	5
The subject describes the basic principles and concepts of power supplies. The subject explains the behavior of linear stabilizers, basic switching regulators, supplies protections, electrochemical supply cells and trends in power supply designs. The subject is meant for diploma project students designing the switching power supplies. It treats the switching power supply design programs and switching regulators component using PC. A special attention is devoted to EMC requirements in switch-mode power supplies as well as to the cost versus operational efficiency ratio. Design of a switch-mode power supply.			
A0M34NSV	VLSI System Design	Z,ZK	4
Introduction to basic building blocks, architecture and design methodologies of advanced VLSI systems. Structure and design of digital and analogue integrated circuit subsystems. Integrated system description and synthesis using cell libraries and IP cores. Synchronization, power consumption and parasitics reduction issues. Testing and reliability of integrated systems. In seminars and labs, the hardware description language VHDL will be explained and used for practical design, synthesis and testing of a system on chip.			
A4M39NUR	User Interface Design	Z,ZK	6
Students will get acquainted with the theory of human-computer communication and interaction (formal description of user interfaces, formal user models, the fundamentals of perception, cognition, and user information evaluation).			
A3M35NES	Nonlinear Systems and Chaos	Z,ZK	6
A0M38OSE	Image Sensors	Z,ZK	5
This course explains the topics of optoelectronic image sensors, especially CCD and CMOS sensors, optical system, illuminators and their application in the computer vision.			
A3M35OFD	Estimation, filtering and detection	Z,ZK	6
This course will cover description of the uncertainty of hidden variables (parameters and state of a dynamic system) using the probability language and methods for their estimation. Based on bayesian prblem formulation principles of rational behsavour under uncertainty will be analysed and used to develp algorithms for estimation of parameters of ARX models and Kalman filtering including the extensions. We will demonstrate numerically robust implementation of the algorithms applicable in real life problems for the areas of industrial process control, robotics and avionics. We will extend the methods for linear gaussian systems to a more generic problems using Monte Calro approach. The course will also cover multimodel approach and its use for the fault detection and isolation and introduction to adaptive control.			
A0M33OSW	Ontologies and Semantic Web	KZ	4
The course "Ontologies and Semantic Web" will guide students through current trends and technologies in the semantic web field. Students will learn designing complex ontologies, thesauri, formalizing them in a suitable formal language, querying them and creating semantic web applications on their top. The second part of the course will be devoted to the efficient management of ontological data and other selected topics.			
AE0M33OSW	Ontologies and Semantic Web	KZ	4
The course "Ontologies and Semantic Web" will guide students through current trends and technologies in the semantic web field. Students will learn designing complex ontologies, thesauri, formalizing them in a suitable formal language, querying them and creating semantic web applications on their top. The second part of the course will be devoted to the efficient management of ontological data and other selected topics. All course materials are in English. In case all attendees are Czech speaking Czech can be spoken.			
A4M35OSP	Open-source programming	Z,ZK	6
The subject provides insight into world of open-source projects and techniques proved to be usefull for larger applications and operating systems development. Reasons leading to the founding of GNU project is discussed and possible andwantages of this approach for cooperation even for commercial subjects is shown. Usual tools used for development, debugging and source code control and functional testing are described. Description of POSIX type operating system structure and introduction to the driver development, user-space libraries and user graphics environments comes next. The last topic is introduction how to use earlier described techniques and support for embedded applications development and real-time control.			
A1M16OVY	Operations Research	Z,ZK	5
Art of modeling and elements of decision models, Linear programming, Transportation problem, Integer linear programming, Introduction to graphs theory, Nonlinear programming, Dynamic programming, Monte Carlo simulation, Project management (CPM, PERT).			

A3M35ORR	Optimal and robust control	Z,ZK	6
This advanced course will cover modern methods for optimal and robust control design. Emphasis will be put on practical computational design skills and realistic application problem formulations. Unifying concept of this course is that of minimizing a system norm. Depending on which norm is minimized, different properties of the resulting controller are guaranteed. Minimizing the H2 system norm leads to the celebrated LQ/LQG optimal control trading off the performance and the effort, while minimizing H _∞ ; norm shifts the focus to robustness against uncertainties in the model. H _∞ -synthesis is an extensions to the H _∞ ; optimal control design methodology than takes the structure of the uncertainty into consideration. Methods for time-optimal and suboptimal control will be presented as well as they proved useful in applications with strict time constraints like positioning of a hard disk drive RW head. As a self-contained add-on to the course, introduction to the topic of semidefinite programming and linear matrix inequalities (LMI) will be made, as these constitute a very elegant theoretical and a powerful computational tool for solving all the previously introduced tasks in optimal and robust control. Methods for reduction of model and controller order complete the course.			
A4M36PAH	Planning and game playing	Z,ZK	6
This course provides an introduction to classical AI planning (linear, nonlinear planning, graph-plan planning, heuristic planning, SAT-based planning) and game-tree representation and methods of adversarial search (such as minimax and alpha/beta pruning).			
A1M16LOG	Business Logistics	Z,ZK	5
Logistics as an integrated system in the structure of business management. Logistics as a part of business strategy. Fundamentals of modern concepts and approaches in logistics. Management, cooperation in supply chain logistics, integrated control systems. Methods applied to flow control and evaluation of elementary parameters of logistics. Logistics market. Logistics integration including its legal, ecological and economical aspects.			
A4M33PAL	Advanced algorithms	Z,ZK	6
Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - syntax analysis and pattern matching.			
A3M33PRO	Advanced robotics	Z,ZK	6
We will explain and demonstrate techniques for modelling, analyzing and identifying robot kinematics. We will explain more advanced principles of the representation of motion in space and the robot descriptions suitable for identification of kinematic parameters from measured data. We will explain how to solve the inverse kinematic task of 6DOF serial manipulators and how it can be used to identify its kinematic parameters. Theory will be demonstrated on simulated tasks and verified on a real industrial robot.			
A4M36PAP	Advanced Computer Architectures	Z,ZK	6
This course extends knowledge of modern computer architecture. Mainly the architecture of nowadays processors utilizing instruction and/or thread level parallelism and advanced pipelining is in the center of our attention. A special emphasis will be devoted to the implementation of parallelism in hardware, parallel program design, and advanced instruction scheduling and execution.			
A4M33RZN	Advanced Methods for Knowledge Representation	Z,ZK	6
This course aims to deepen understanding of knowledge representation principles beyond the predicate logic formalism. Firstly, the course presents ontologies and description logic, the principle elements of semantic web. Then, attention will be paid to statements whose validity varies in time. Uncertainty makes the next issue to be discussed. Modal logic extends the classical logic with additional modalities, namely, possibility, probability, and necessity. Probabilistic graphical models associate the classical probabilistic theory with the graph theory. Fuzzy sets allow to represent vagueness.			
A3M99PTO	Team Work	KZ	6
The aim of this course is to get the students knowledgeable to work in teams. How to manage the team and methodology of the team work will be guided by specialists from the industry during lectures. Students will be working on real problems during labs.			
A3M35PSR	Real-Time Systems Programming	Z,ZK	6
The goal of this subject is to give students basic knowledge in the area of software design for embedded systems with real-time operating systems (RTOS) with emphasis to practical experience. Students will solve several simple tasks to get basic knowledge about RTOS VxWorks and to measure timing parameters of the RTOS and hardware, which are necessary when choosing a platform for a given application. Then a more complicated task (motor control) will be solved, which will fully utilize means of RTOS VxWorks. During lectures, students will become familiar with real-time systems theory, which can be used to formally prove the timing correctness of the applications. Moreover, some software engineering techniques, which help with increasing of quality of safety-critical systems will be discussed.			
A1M16PMG	Project Management	KZ	5
Processes and techniques for the preparation of entrepreneurial projects. Principles and methods of planning and operating of projects realization. Operating of the integration and project area. Operating of time, costs, sources, duality, human sources, communication, risks. Case study in the program Microsoft Project.			
A0M32PRD	Data Communication Means	Z,ZK	5
A0M13PRE	Industrial electronics	Z,ZK	5
Electronic components, resistors, capacitors, HF coils, transformers Semiconductor devices Mounting technologies Sensore, regulating equipments Power converters.HF heating equipments. Electromagnetic compatibility in power electronic.			
A0M35PII	Industrial Informatics and Internet	Z,ZK	6
The use of Internet technologies in informatics and industry. Communication protocols in the Internet distributed applications, database systems and their management, enterprise management systems. Web services, mobile network, security and reliability, critical applications.			
A0M33PIS	Industrial Information Systems	Z,ZK	6
The aim of this course is to make students familiar with IT support of industrial systems controlled and integrated with computational systems, and teach students to consider respective system requirements. The course deals with IT infrastructure support, modeling of business systems, their data flow, functional models and methods for modeling of non-functional requirements, with focus to stability, planning, security and quality management.			
A1M15PRE	Transmission and Distribution of Electricity	Z,ZK	5
The subject gives a complex overview about the electricity transmission and distribution task. It deals with particular elements technical parameters and gives information about the total behaviour in steady and transient states. Students are informed about supporting devices enabling safe and reliable operation.			
A1M16RES	Development of Energy Systems	Z,ZK	5
A3M35RIS	Control Systems	Z,ZK	6
Process control using industrial control systems, programmable logic controllers, visualisation of technological processes. Hierarchical control systems, industrial communications for factory and process automation. Open software technologies, safety and reliability of control applications.			
A1M14RPO	Electric Drive Control	Z,ZK	5
Controlled electric drive, control computer of electric drive - system view, modulation methods, scalar control, quantity transformation, FOC control, DTC control, compatible rectifier, servo-drives, digital signal processing, discrete function, difference equation, digital filters, digital controllers, PSD controller, derivation and difference equation coefficients calculation, fixed point and floating point calculations, relative units and quantity normalization, digital signal processors, modulator hardware support, control algorithm implementation, microprocessor control system hardware implementation, protection circuitry, debugging, testing and monitoring			
A1M15RES	Control of Power Systems	Z,ZK	5
The subject introduces electrification system physical and economical characteristics and models. It deals with modes optimization, active and reactive power control in isolated and interconnected systems, extraordinary states solving and reliability evaluation. It describes also the current situation of the energy market liberalization and sources operation in it.			
A1M16JAK	Quality management	Z,ZK	5
Concept of Quality, History of quality management (QM), Current approaches to QM, Approach to quality in EU and CR, Quality management system (QMS) based on ISO 9001, Process management, Quality planning, Metrology in QM, Control of documents and records, Internal audits of QMS, Continual improvement of QMS, Integrated management, Statistic methods in QM, Accreditation and certification			

A3M38SPD	Data Acquisition and Transfer	Z,ZK	6
Subject is devoted to distributed and centralized DAQ systems and to the design of their elements. Selected industrial interfaces and buses (CAN, Profibus, HART, Modbus, Ethernet), VXI/PXI systems, USB and wireless sensor networks (ZigBee, WiFi) are presented in detail in order to provide information required for efficient design of their components. Project-oriented laboratories provide students with practical experience in the implementation of modern DAQ systems.			
A1M14SOP	Simulation and Optimization in Drives	Z,ZK	5
Models of dynamic systems. Methods and process of simulation. Programs Pspice, Schematics and Probe. Circuit models of semiconductor converters. Dynamic models of converters in average values. Electric drive as a system. State space representation of models and its solution. Numerical methods and optimization. Models of converters and machines for high frequencies. Programs Matlab, Simulink. Methods of finite elements and its use for magnetic field optimization in electric machine. Development process and SW tools for design of main types of electric machines			
A1M13SVS	Simulation of Production Systems	Z,ZK	5
The course is focused at methods of static and dynamic models of processes and systems forming. Basic types of models are described and characterized. Models are built up using an analytical way on the basis of knowledge of relationships between parameters, or using an experimental way. Factorial experiments for qualitative variables are presented. Computer aided generation of mathematical models and simulation of dynamic behavior of processes and systems are described. Basic methods of component models compilation, assembly of a complete model are presented. The application on computer modeling and simulation of electrical, thermal and mechanical systems in power electrical engineering completes the lectures.			
A0M15SZS	Reliability and Security of Power Systems	Z,ZK	5
The aim of the subject is acquiring basic knowledge of security and reliability of power electrical systems based on the deterministic and mainly probabilistic analysis. After the introductory summarisation and extension of the mathematical tools for probabilistic and statistic calculations, the methodology of evaluation of the reliability of the systems is mainly discussed starting from the reliability of its particular elements in various operation regimes. Attention is also paid to problems of maintenance and mathematical simulation of the destructive tests.			
A1M16STA	Statistical methods in economics	Z,ZK	5
Basic Concepts. Statistical series. Assortment. Distributions of frequencies. One-dimensional descriptive characteristics. Measures of variables, coefficient of skewness, coefficient of excess. Points estimates of basic characteristics. Interval estimates of basic characteristics. Hypothesis testing of basic characteristics. Individual indexes number. Aggregative indexes. Variable-structure indexes. Multifactor indexes. Correlation and regression, Basic Concepts. Measurement of dependence intensity. Time series, concepts, qualities. Chronological average. Time series - trends and extrapolation.			
A1M14SSE	Machinery structures of power plants	Z,ZK	4
The aim of subject is to acquaint with natural relations of energy conversions at power-producing premises, to describe functions of power-producing equipment, their structure, properties and characteristics.			
A4M33SAD	Machine Learning and Data Analysis	Z,ZK	6
The course explains machine learning methods helpful for getting insight into data by automatically discovering interpretable data models such as graph- and rule-based. The course will also address a theoretical framework explaining why/when the explained algorithms can in principle be expected to work. The lectures are given in English.			
A0M37SEK	Synchronization and equalization in digital communications	Z,ZK	4
We explain principles of the receiver signal processing (synchronization and equalization) for the parametric channel including variety of the implementation possibilities. We focus on the essential particular forms of the channel phase, frequency and timing parameterization, channels with multipath propagation and MIMO channels. We develop the ideas of synchronization and equalization in the context of the data decoding in the parametric channel. All basic categories of the CSE algorithms are targeted: feed-forward, feed-back, iterative and recursive, including the theoretical background of the parameter estimation theory, and theory of the feed-back and iterative systems.			
A1M16SIR	System Analysis and Decision Making	Z,ZK	5
System approach and decision making, Decision models, Games theory, Decision making under uncertainty and risk, Decisions with multiple objectives, Stochastic programming, Expert systems.			
A1M15TVN	High Voltage Engineering	Z,ZK	5
The subject introduces students with high voltage technique from point of view of its application in power engineering. It brings information about high voltage testing sources and the possibilities of measuring high voltages and big currents. It informs about high voltage insulation systems and methods for determining their states. There are explained particular types of electrical discharges and the possibilities of their elimination. Practical seminars are based on measurements in the high voltage laboratory.			
A1M13TPR	Technological Project Planning	Z,ZK	5
What is a project management? What is a life cycle of product and project? Project phases: Initial, Construct, Delivery and Support. Organisational structure. SWOT, PEST and 5P analyses. Workflow and business processes. Schedule, GANTT, PERT. Enterprise and project modelling. Management of documentation, recourses, quality and knowledge. Standards for exchange of product and business data. Enterprise ontology.			
A0M13TKS	Technology of Cables and Optical waveguides	Z,ZK	5
- Cable engineering-materials,machines and production methods - The engineering and properties of metal cables - The technology and properties of optical fibres and cables - The fibre connectors evaluation - Ending end branching of power cables - The power cables and optical fibres diagnostics			
A1M32TSY	Telecommunication Systems	Z,ZK	4
The subject discusses telecommunication networks from different perspectives - physical principles, structure, applications, etc. Students are introduced to elementary concepts and principles in the area of communications. The presented principles and methods are illustrated using examples of specific communication networks - ISDN, data transmission networks, fixed as well as mobile ones. Emphasis is put on applications related to power lines.			
A4M33TZ	Theoretical foundations of computer vision, graphics, and interaction	Z,ZK	6
We will explain fundamentals of image and space geometry including Euclidean, affine and projective geometry, the model of a perspective camera, image transformations induced by camera motion, and image normalization for object recognition. Then we will study methods of calculating geometrical objects in images and space, estimating geometrical models from observed data, and for calculating geometric and physical properties of observed objects. The theory will be demonstrated on practical task of creating mosaics from images, measuring the geometry of objects by a camera, and reconstructing geometrical and physical properties of objects from their projections. We will build on linear algebra, probability theory, numerical mathematics and optimization and lay down foundation for other subjects such as computational geometry, computer vision, computer graphics, digital image processing and recognition of objects in images.			
A4M01TAL	Theory of Algorithms	Z,ZK	6
The course brings theoretical background of the theory of algorithms with the focus at first on the time and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of complexity; the classes P, NP, NP-complete, PSPACE and NPSpace are treated and properties of them investigated. Probabilistic algorithms are studied and the classes RP and ZPP introduced.			
A3M35TDS	Theory of Dynamical Systems	Z,ZK	8
The purpose of this course is to introduce mathematical tools for the description, analysis, and partly also synthesis, of dynamical systems. The focus will be on linear time-invariant multi-input multi-output systems and their properties such as stability, controllability, observability and state realization. State feedback, state estimation, and the design of stabilizing controllers will be explained in detail. Partially covered will be also time-varying and nonlinear systems. Some of the tools introduced in this course are readily applicable to engineering problems such as the analysis of controllability and observability in the design of flexible space structures, the design of state feedback in aircraft control, and the estimation of state variables. The main motivation, however, is to pave the way for the advanced courses of the study program. The prerequisites for this course include undergraduate level linear algebra, differential equations, and Laplace and z transforms.			

A4M33TVS	Software Verification and Testing	Z,ZK	6
This course will introduce the theoretical foundations and mathematical concepts necessary for rigorous software testing, including the definitions of fundamental system characteristics, such as reliability, robustness and correctness of the software system. We will emphasize the techniques and abstract tools necessary for validation of the correctness and reliability characteristics of the software. In the first part of the course, we will introduce the existing techniques and paradigms for system testing (black/white box, formal methods, structural analysis), including the methods for test number reduction and automation. The second part of the course will concentrate on formal methods for system verification. We will introduce the formal frameworks necessary for the dynamic description of system properties (Z-notation, temporal logic) and the applicable verification methods (model checking, theorem proving) working on these representations.			
A0M17TMS	Perspectives in Millimetre and Submillimetre Technology	Z,ZK	5
The subject gives practical knowledge dealing with emerging technology in new progressive frequency bands. It gives the basement of millimeter and submillimeter technology and mutual interactions submm and optical technology. In frame of the subject the theoretical principles as well as specific approaches to solution of transmission lines, subsystems and links in mm and submm region are mentioned.			
A3M33UI	Artificial Intelligence	Z,ZK	6
The course is aimed at providing theoretically deeper knowledge in the area of Artificial Intelligence in the extent needed to study the branch of study Robotics. It is organized around several topics: pattern recognition and machine learning, theory of multi-agent systems and artificial life. The linkage between the theoretical and practical applications is rather stressed.			
A3M38VBM	Videometry and Contactless Measurement	Z,ZK	6
This course explains the topics of optoelectronic sensors, especially CCD sensors, and their application in the videometry based contactless measurements. The problems of CCD line and area sensors, design of measuring cameras and the methods of signal processing are presented.			
A3M38VIP	Virtual Instruments	Z,ZK	6
A subject deals with programming virtual instruments based on standardized interfaces (PCI, PXI, VXI). Lectures are focused on application of up-to-date standards for data acquisition systems programming (VXIplug&play, VISA, IVI) and selected software techniques in Windows and Linux operating systems. Assigned software tasks in laboratories are solved using C/C++ language or LabVIEW environment.			
A4M39VIZ	Visualization	Z,ZK	6
In this course, you will get the knowledge of theoretical background for visualization and the application of visualization in real-world examples. The visualization methods are aimed at exploiting both the full power of computer technologies and the characteristics (and limits) of human perception. Well-chosen visualization methods can help to reveal hidden dependencies in the data that are not evident at the first glance. This in turn enables a more precise analysis of the data, or provides a deeper insight into the core of the particular problem represented by the data.			
A1M14VE2	Power Electronics 2	Z,ZK	5
Rectifiers with active load, discontinuous and continuous current, multiple commutation, three-phase AC/AC converters, electrostatic separators, welding rectifiers, battery chargers, superconductive magnetic energy reservoir, induction heating, reactive power compensation, contactless switches, softstarters, resistor pulse control, cathodic prevention, power transistor in switching mode, snubbers, structure and control principles of modern controlled drive, pulse width modulation methods, principles of vector control and direct control, pulse width modulated rectifiers, matrix converters, converter protection against current overload and against overvoltage			
A4M39VG	Computational Geometry	Z,ZK	6
The goal of computational geometry is analysis and design of efficient algorithms for determining properties and relations of geometric entities. The lecture focuses on geometric search, point location, convex hull construction for sets of points in d-dimensional space, searching nearest neighbor points, computing intersection of polygonal areas, geometry of parallelograms. New directions in algorithmic design. Computational geometry is applied not only in geometric applications, but also in common database searching problems.			
A1M13VEZ	Manufacturing of Electronic Equipment	Z,ZK	5
Mechanical and electrical design. The electric contact. Joining of conductors. Cooling of components and equipment Printed circuit boards fabrication. Soldering in electronics. Electromagnetic compatibility of electronic equipment. Protection of components and equipment, sensitive on electrostatic field. Certification, accreditation, quality control and quality assurance.			
A1M13VES	Manufacturing of Electrical Components	KZ	4
Technology of electric components in general. Basic technology in use. Type of components: resistors, potentiometers, capacitors with foil dielectric. Ceramic and electrolytic capacitors. Electromechanical devices . Semiconductors, fabrication of vertical and horizontal structures. Packaging.			
A1M16VEN	Power and Heat Production	KZ	5
Power sources, energy processes, general power plant, power balance and charakteristic curves. Review of energy production technologies (conventional and non conventional) - electricity, steam, hot water, coal, liquid fuels, gas. Power generation stations, their basic parts, their basic operational charakteristic curves and calculations, operation, control. Environmental effects of power generating and actions of their minimization.			
A0M31ZLE	Basics of Medical Electronics	Z,ZK	4
Students will study fundamental principles applied within the modern medical devices and systems, esp. from the point of view of functional blocks and electronic circuits of diagnostical and therapeutical medical equipments including electrocardiographs, electroencephalographs, bedside and central monitors, equipments for anesthesiology, intensive and critical healthcare, equipments for clinical laboratory, electrostimulators, cardiostimulators and defibrilators, blood pressure and flow measurement (including dilution) and pulse oxymetry.			
A3M38ZDS	Analog Signal Processing and Digitalization	Z,ZK	6
The course is dedicated to methods for preprocessing, digitalization and reconstruction of continuis signals. It is focused to the methods for achieving of high precision of transmission and suppression of spurious components. The laboratory exercises are divided into two parts: the first part is classical tasks; the second one is individual project of design of typically data acquisition system. The teaching is supported by the CAD system for measuring circuits.			
A0M37ZV2	Audio Technology 2	Z,ZK	4
This course deals with advanced topics related to audio technology in recording studios, namely room acoustics, multichannel signal recording and reproduction, digital audio signal processing, its impact on auditory perception, audio signal optimization from the psychoacoustic point of view. Measuring methods related to these topics are also presented.			
A0M02ZIP	Environmental Science	ZK	2
Attention is devoted to the basis of ecology, to the growth of human population, to the capitalization of energy and to other resources of the biosphere. The pollution of water, soil, and air together with a waste treatment is evaluated. The impact of mechanic, electric, magnetic fields and chemical components to environment is also discussed. Economy, law and morality in relation to environment are dealt with.			
A4M33TDV	3D Computer Vision	Z,ZK	6
This course introduces methods and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and their essence well enough to be able to build variants of simple systems for reconstruction of 3D objects from a set of images or video, for inserting virtual objects to video-signal source, or for computing ego-motion trajectory from a sequence of images. The labs will be hands-on, the student will be gradually building a small functional 3D scene reconstruction system.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
A003TV	Physical Education	Z	2
A0B04CA	Technical English for Pre-Intermediate	Z	2
A0B04CAE1	Certificate of Advanced English CAE 1	Z	2
<p>The aim of the course is to prepare for Certificate of Advanced English - the second highest level Cambridge ESOL exam. The course CAE1 covers units 1-4. Studying for CAE helps you to improve your language skills (reading, writing, English in use, listening and speaking) and use them in a wide range of contexts. The exam is based on realistic tasks and indicates the ability to use the language in practical situations. You will be able to participate in meetings and discussions, expressing opinions clearly and be able to understand and produce texts of various types. CAE is recognised by the majority of universities in English speaking countries as proof of adequate language skills for courses taught and assessed in English as well as by employers who require knowledge of a foreign language. CAE is taken by more than 60 000 people each year in more than 60 countries. It is possible but not necessary for obtaining credit to take CAE at British Council.</p>			
A0B04CAE2	Certificate of Advanced English CAE 2	Z	2
<p>The aim of the course is to prepare for Certificate of Advanced English - the second highest level Cambridge ESOL exam. The course CAE2 covers units 5-8. Studying for CAE helps you to improve your language skills (reading, writing, English in use, listening and speaking) and use them in a wide range of contexts. The exam is based on realistic tasks and indicates the ability to use the language in practical situations. You will be able to participate in meetings and discussions, expressing opinions clearly and be able to understand and produce texts of various types. CAE is recognised by the majority of universities in English speaking countries as proof of adequate language skills for courses taught and assessed in English as well as by employers who require knowledge of a foreign language. CAE is taken by more than 60 000 people each year in more than 60 countries. It is possible but not necessary for obtaining credit to take CAE at British Council. Student is allowed to enrol only into one CAE course during one semester.</p>			
A0B04CAE3	Certificate of Advanced English CAE 3	Z	2
<p>The aim of the course is to prepare for Certificate of Advanced English - the second highest level Cambridge ESOL exam. The course CAE3 covers unit 9 - 12. Studying for CAE helps you to improve your language skills (reading, writing English in use, listening and speaking) and use them in a wide range of contexts.</p>			
A0B04CAE4	Certificate of Advanced English 4	Z	
A0B04CIN		Z	2
A0B04F1	French language 1	Z	2
A0B04F2	French language 2	Z	2
A0B04F3	French Language 3	Z	2
A0B04FCE1	FCE 1	Z	2
<p>The course is aimed for students, employees of the Faculty and the public whose knowledge of English corresponds to B1 level according to the European Language Frame. The course focuses on improving all language skills - writing, speaking, reading, listening, grammar and phonetics - and is submitted to the goal of obtaining the required skills needed for B2 ELF.</p>			
A0B04FCE2	FCE 2	Z	2
<p>The course is aimed for students, employees of the Faculty and the public whose knowledge of English corresponds to B1 level according to the European Language Frame. The course focuses on improving all language skills - writing, speaking, reading, listening, grammar and phonetics - and is submitted to the goal of obtaining the required skills needed for B2 ELF.</p>			
A0B04FCE3	FCE 3	Z	2
<p>The course is aimed for students, employees of the Faculty and the public whose knowledge of English corresponds to B1 level according to the Common European Framework of Reference for Languages (CEFR). The course focuses on improving all language skills - writing, speaking, reading, listening, grammar and phonetics - and is submitted to the goal of obtaining the required skills needed for B2 CEFR.</p>			
A0B04FCE4	FCE4	Z	2
<p>The course is aimed for students, employees of the Faculty and the public whose knowledge of English corresponds to B1 level according to the European Language Frame. The course focuses on improving all language skills - writing, speaking, reading, listening, grammar and phonetics - and is submitted to the goal of obtaining the required skills needed for B2 ELF.</p>			
A0B04GA		Z	2
<p>The aim of this course is to extend and complement grammatical patterns covered in other English courses that are intended for full-time students. The course is meant mainly as a supplement for students who have not yet passed the B2 examination and are interested in further study and additional practice.</p>			
A0B04GN	German Grammar	Z	2
A0B04JAP	Japanese	Z	2
A0B04KA	English Conversation 2	Z	2
<p>The course is designed for students who want to develop their communication skills. Students will be given the opportunity to use the vocabulary they already know, as well as learn new words and phrases, to communicate on a variety of topics and themes. This course is not designed for beginners.</p>			
A0B04KF1	French conversation 1	Z	2
A0B04KF2	French conversation 1	Z	2
A0B04KN	German Conversation	Z	2
A0B04KN2	German conversation 2	Z	2
A0B04KR	Russian conversation	Z	2
A0B04KR2	Russian conversation 2	Z	2
A0B04KS1	Spanish conversation 1	Z	2
A0B04KS2	Spanish conversation 2	Z	2
A0B04N1	German language 1	Z	2
A0B04N2	German language 2	Z	2
A0B04N3	German language 3	Z	2

A0B04OA	Technical English Course	Z	2
The course is designed for students who have completed the B2 English course. Its main objective is to prepare students for the study of selected specialized courses in English by covering a broader range of topics in engineering. In addition to teaching materials aimed at expanding technical vocabulary and consolidating current language skills, the focus is on authentic articles adapted from professional journals and accompanying videos. The syllabus also leaves space for students' presentations covering various fields of science.			
A0B04ON	Professional German	Z	2
A0B04PZP	Preparation for stay in Germany	Z	2
A0B04R1	Russian language 1	Z	2
A0B04R2	Russian language 2	Z	2
A0B04R3	Russian language 3	Z	2
A0B04R4	Russian language 3	Z	2
A0B04RET	Rhetoric	Z	2
The objective of the subject is to master and improve skills necessary for successful presentation as well as enhancing the communicative ability of the prospective engineers and bachelors. This subject will enable the students to develop both spoken and written presentations, non verbal communication and remove the psychological barriers for public speaking so that the students can create a good image. The course "Retorika" provides an introduction to this subject.			
A0B04S1	Spanish language 1	Z	2
A0B04S2	Spanish language 2	Z	2
A0B04S3	Spanish language 3	Z	2
A0B04S4	Spanish Language 4	Z	2
A0B16FIL	Philosophy	ZK	2
A0B16HTE	History of technology and economic	ZK	2
A0B16MPL	Management psychology	ZK	2
Psychology of personality, psychology of work and organization. Psychology in human resources management. The manager, his role and competencies. Motivation and engagement. Skills development. Communication and conflict resolution. Work group and team, conducting meetings. Time management and delegation. Dealing with stress and emotions. Company culture and organizational change.			
A0M02AKA	Acoustic Applications	KZ	4
Lecture summarize applications in physical acoustics, room and building acoustics, environmental acoustics, noise and vibration control, physiological acoustics, diagnostics, and ultrasound.			
A0M02DIP	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
A0M02FEN	Physics for Electroenergetics	Z,ZK	4
Lessons contain selected parts of physics for students of electric power engineering: Physical principles of gas discharges - glow, arc, spark and corona discharges and their applications. The students become acquainted with methods for nuclear fission and fusion energy generation. The introduction to structural properties of matter and its thermal, electrical and magnetic properties. A part of the course is two excursions in Laboratories of Czech Academy of Sciences.			
A0M02FPL	Solid State Physics	Z,ZK	5
Elementary physics of solids for students of electrotechnology. Description and classification of solids. Thermal properties of solids. Types of bonds in solids. Real crystals, their defects and surfaces. Electrons in solids, the band structure, electrons and holes. Metals, semiconductors, insulators. Transport phenomena, generation and recombination of minority carriers. Magnetism, magnetic properties of solids. Optical phenomena in solids, luminescence, stimulated emission.			
A0M02ZIP	Environmental Science	ZK	2
Attention is devoted to the basis of ecology, to the growth of human population, to the capitalization of energy and to other resources of the biosphere. The pollution of water, soil, and air together with a waste treatment is evaluated. The impact of mechanic, electric, magnetic fields and chemical components to environment is also discussed. Economy, law and morality in relation to environment are dealt with.			
A0M13DIP	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study program. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
A0M13KTM	Construction and Technology of Microcomputers	Z,ZK	5
Microcomputers for control of technological systems, architecture, timing, instructions, basic parts, embedded microprocessors, input/output. Supplementary circuits. Control of technological systems. Microprocessor development system, design of microcomputer and application. Industrial standards. Design of microcomputers - modular and built-in systems, industrial PC. SCADA systems.			
A0M13MKV	Advanced Components of Power Electronic	Z,ZK	5
Power semiconductor device (diodes, BJTs, thyristors, MOSFETs and IGBTs) and integrated structures (modules). Structures, function, characteristics and parameters, conditions for reliable operation. Connection of devices in parallel and in series. Operating reliability of power components and equipments.			
A0M13PRE	Industrial electronics	Z,ZK	5
Electronic components , resistors, capacitors, HF coils, transformers Semiconductor devices Mounting technologies Senzore, regulating equipments Power converters.HF heating equipments. Electromagnetic compatibility in power electronic.			
A0M13TKS	Technology of Cables and Optical waveguides	Z,ZK	5
- Cable engineering-materials,machines and production methods - The engineering and properties of metal cables - The technology and properties of optical fibres and cables - The fibre connectors evaluation - Ending end branching of power cables - The power cables and optical fibres diagnostics			
A0M14AML	Aerodynamics and Mechanics of Flight	Z,ZK	4
Subject clarifies substantial relations and effects of force influence of flowing fluid on surface of airfoil, wing or complete airplane at subsonic or supersonic airspeeds. Further, subject deals with basic tasks of airplane performance and necessary conditions for airplane stability and control.			
A0M14DGP	Electric Drive Diagnostics	Z,ZK	5
Power electronics control computer structure, digital signal processor and ALU added features for fast real time calculations. Interrupt system and DMA system, analog signal measurement, fast impulse signal measurement, fast impulse generation support, inter-computer communication, system and power management, programming languages for power systems software development, programming techniques, software development tools (simulators, emulators, monitors), input signal conditioning circuitry, conversion from analog signals to digital processing, time sampling, amplitude quatization, power electronics control block design and implementation, difference equations and control algorithms, fixed and floating point calculations, debugging methods, program parametrization, guides and rules for implementation and application of power system control computers. Real time operating system, scheduler, dispatcher and another features and guides for application			
A0M14DIP	Diploma Project	Z	25

A0M14DMP	Dynamics of mechanical parts of drives	Z,ZK	4
Subject is oriented to mathematical description and solving of dynamic processes in mechanic parts of machines and drives. Dynamics of rotational and general plane motion, effects of inertial forces on body, balancing of rotors. Vector and analytic methods of composing equations of motion of systems and their solving. Vibration in machine set and vibration effects reducing. Stress and deformation in rotating parts, critical speed of rotors. Drives characteristics and transient events in systems with driving aggregates .			
A0M14KOP	Electric Drive Component Design	Z,ZK	5
Theoretical principles and pragmatic procedures in main types electric drives for transtort, automatisaton and manipulating technics design. Selection, dimensionning and realisation of drives components: power supply, switching devices, protection, semiconductor converter, electric motor. Project, verification of dimensionning and testing of drive components, realisation of selected part on model drive, experimental parameters examination. Semestrial project optionally fixed on theoterical design, realisation or experimental parameters verification			
A0M14KSP	Drive Communication Systems	Z,ZK	5
Electric drive distributed control system - system view, serial communication primer, computer network topology, point-to-point, bus, loop, bus access methods, master-slave, peer-to-peer, CSMA/CD, CSMA/CR, addressed transmission, broadcasting, baud-rate, synchronous and asynchronous transmission, channel bandwidth, transmission synchronization, bit and character stuffing/destuffing, modulation, bit encoding, frame, transfer protocol, protocol overhead, error detection, acknowledged and unacknowledged communication, transmission media and environment , OSI model and other layered models, overview of industrial communication technologies utilized in drives and their features, UART, USART, ProfiBus, HDLC, SDLCL, Bitbus, LIN bus, CAN bus, CANOpen, LonWorks, EIB/KNX, Ethernet, TCN-MVB/WTB, Microwire, SPI, I2C, USB. Communication services programming and their implementation inside overall control computer software architecture. Communication development tools, communication services debugging, monitoring and logging. Noise resistance, cabling, connectors			
A0M14MDS	Simulation of dynamic systems	Z,ZK	4
Aim of subject is simulation of nonlinear problems from fields of dynamics of rigid bodies, fluid mechanics, aerodynamics, thermodynamics and their mutual combinations. In scope of subject is given overview of substantial derivations, relations, formulas and numeric methods. Seminars are focused on assembling of numeric models in program Matlab-Simulink			
A0M15DIP	Master's thesis	Z	25
A0M15Ezs	Electrical Sources and Systems	Z,ZK	5
The subject is focused on the task of power quality, its operational criteria and improvement possibilities. There are also discussed specific tasks of dispersed generation and electrical systems. The student is then informed about basic electrical energy renewable sources and their connection possibilities to the system.			
A0M15Szs	Reliability and Security of Power Systems	Z,ZK	5
The aim of the subject is acquiring basic knowledge of security and reliability of power electrical systems based on the deterministic and mainly probabilistic analysis. After the introductory summarisation and extension of the mathematical tools for probabilistic and statistic calculations, the methodology of evaluation of the reliability of the systems is mainly discussed starting from the reliability of its particular elements in various operation regimes. Attention is also paid to problems of maintenance and mathematical simulation of the destructive tests.			
A0M16DIP	Diploma thesis	Z	25
A0M16EKE	Economy of Power Industry	KZ	4
Fundamentals of financing of power companies. Cost structure of power generation and distribution. Prices and tariff systems for power, heat and gas production and distribution. Examples of economic evaluation and investment appraisal of the typical project in power sector. Renewable energy sources, externalities. Energy policy and energy law in CR. Liberalization and power market development.			
A0M16FI2	Philosophy II	Z,ZK	4
The course is oriented on the transdisciplinary aspects of philosophy, informatics, physics, mathematics and biology.			
A0M16HT2	History of science and technology 2	Z,ZK	4
This subject traces historical developments in electrical engineering branches in the world and in the Czech Lands. Its ultimate goal is to stimulate students' interest in the history and traditions of the subject, while highlighting the developments in technical education and professional organizations, the process of shaping scientific life and the influence of technical engineers			
A0M16MGM	Management	Z,ZK	5
The methods and procedures of effective management for company leading in competitors area.			
A0M16MPS	Psychology	Z,ZK	4
A0M16TE1	Theology	Z,ZK	4
This subject provides to students the basic orientation in christian theology and requires no special previous education. After short philosophic lecture the basic theologic disciplines are gone through. The subject is determined not only to believer students who want to know the reliable theologic grounding but also above all to ones who want to get know Christianity - religion from which grows our civilization up.			
A0M17DIP	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination. Diploma projects deals with microwave technique, antennas, propagation, optical communications, EMC, and medical applications.			
A0M17NKA	Antenna Design and Technology	Z,ZK	5
Basics of practical design of antennas for specific frequency bands, modeling, design and construction of antenna and antenna systems. Antenna measurement methods, practical measurements in antenna laboratory. Modeling on professional software tools for antenna design.			
A0M17TMS	Perspectives in Millimetre and Submillimetre Technology	Z,ZK	5
The subject gives practical knowledge dealing with emerging technology in new progressive frequency bands. It gives the basement of millimeter and submillimeter technology and mutual interactions submm and optical technology. In frame of the subject the theoretical principles as well as specific approaches to solution of transmission lines, subsystems and links in mm and submm region are mentioned.			
A0M31ACS	Architectures of Digital Systems	Z,ZK	4
Types of processor architectures, singlechip and multichip computers. Processor structures for real-time digital signal processing. Data flow driven computers. Artificial neural nets. Structures designed in accordance with procedures of data processing, architectonical considerations. Design of circuits for digital signal processing and arithmetic operations, design of processors and peripherals, low-power design techniques. Data synchronization and communication between asynchronous clock-domains			
A0M31ASN	Algorithms and Structures of Neurocomputers	Z,ZK	5
Information about the basic principles and possibility of the application of the neural informative technology for the signal processing are the main topic. The lectures are devoted to the introduction into the artificial neural networks (NN) theory and applications, to the choice and the optimisation of the structures, the choice of the data, and to the solutions of the classification. The neural network applications at the speech and image processing are investigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the SOM are described. The applications are o focused to EEG and ECG processing, also to possibilities of applications ANN at physiotherapy,			
A0M31DIP	Diploma Thesis	Z	25
A0M31EOF	Electronic Circuits and Filters	Z,ZK	5
Subject deepens and consolidates knowledge in the field of analog electronic circuits and frequency-selection filters. Analytical procedures are the gist that lead from complete models of analog integrated circuit structures, through the simplification, to a deeper understanding of their characteristic. Design fundamental is obtained by the analysis of the dominant influences to the circuit activities. Design and realizations of analog filters is introduced in the next part.			

A0M31ZLE	Basics of Medical Electronics	Z,ZK	4
Students will study fundamental principles applied within the modern medical devices and systems, esp. from the point of view of functional blocks and electronic circuits of diagnostic and therapeutic medical equipments including electrocardiographs, electroencephalographs, bedside and central monitors, equipments for anesthesiology, intensive and critical healthcare, equipments for clinical laboratory, electrostimulators, cardiostimulators and defibrillators, blood pressure and flow measurement (including dilution) and pulse oxymetry.			
A0M32DIP	Diploma project	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
A0M32KMP	Communications and Media Law	Z,ZK	4
A complex course dedicated to interdisciplinary problems - the legal aspects of electronic communications (information and communications systems), as well as media from the viewpoint of European and national law. It analyses the areas of informatics, electronic communications, information society services, copyright and general intellectual property rights, the protection of identity, introduction to software law and the Internet as a global communication and information system.			
A0M32PRD	Data Communication Means	Z,ZK	5
A0M33DIP	Diploma Thesis	Z	25
A0M33EOA	Evolutionary Optimization Algorithms	Z,ZK	6
The course aims at issues related to the application of evolutionary algorithms in practice and at the methods used to solve them. Evolutionary algorithms are optimization metaheuristics that use analogies with natural evolution to solve complex optimization tasks. The course builds on and extends knowledge from the course Bio-inspired algorithms. In the seminar and lab lectures, the students will get hands-on tutorials and will be obliged to implement their own evolutionary algorithm to solve an optimization task as part of their project.			
A0M33OSW	Ontologies and Semantic Web	KZ	4
The course "Ontologies and Semantic Web" will guide students through current trends and technologies in the semantic web field. Students will learn designing complex ontologies, thesauri, formalizing them in a suitable formal language, querying them and creating semantic web applications on their top. The second part of the course will be devoted to the efficient management of ontological data and other selected topics.			
A0M33PIS	Industrial Information Systems	Z,ZK	6
The aim of this course is to make students familiar with IT support of industrial systems controlled and integrated with computational systems, and teach students to consider respective system requirements. The course deals with IT infrastructure support, modeling of business systems, their data flow, functional models and methods for modeling of non-functional requirements, with focus to stability, planning, security and quality management.			
A0M34DIP	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
A0M34EVS	Electronic Security Systems	Z,ZK	5
The subject describes the system design, electronic solutions, conception characteristics, reliability and its increasing of electronic security and safety systems. It reports solutions of electronic sensor systems and methods of security system design, usage of modern electronic components and microprocessors. It offers practical applications suitable for safety systems of houses, cars, industry companies.			
A0M34NFO	Design of Photonic Circuits	Z,ZK	4
Students obtain practical skills with design of photonics devices and their applications in photonics systems. Students acquaint with BMP, FULL WAVE and TCAD programs. These software allowed design optics structures and devices using for controlling and distribution optical signals. Software TCAD is used for design of injection optical sources. Optoelectronic integrated circuits will be design by WINMIDE and ORCAD programmes.			
A0M34NNZ	Design of Power Supplies for Electronics	Z,ZK	5
The subject describes the basic principles and concepts of power supplies. The subject explains the behavior of linear stabilizers, basic switching regulators, supplies protections, electrochemical supply cells and trends in power supply designs. The subject is meant for diploma project students designing the switching power supplies. It treats the switching power supply design programs and switching regulators component using PC. A special attention is devoted to EMC requirements in switch-mode power supplies as well as to the cost versus operational efficiency ratio. Design of a switch-mode power supply.			
A0M34NSV	VLSI System Design	Z,ZK	4
Introduction to basic building blocks, architecture and design methodologies of advanced VLSI systems. Structure and design of digital and analogue integrated circuit subsystems. Integrated system description and synthesis using cell libraries and IP cores. Synchronization, power consumption and parasitics reduction issues. Testing and reliability of integrated systems. In seminars and labs, the hardware description language VHDL will be explained and used for practical design, synthesis and testing of a system on chip.			
A0M35DIP	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
A0M35PII	Industrial Informatics and Internet	Z,ZK	6
The use of Internet technologies in informatics and industry. Communication protocols in the Internet distributed applications, database systems and their management, enterprise management systems. Web services, mobile network, security and reliability, critical applications.			
A0M36DIP	Diploma Thesis	Z	25
A0M37CIR	Implementation of the digital circuits in Radio	Z,ZK	5
The course is base for student, which want practically designed circuits of the digital signal processing with the signal processors and specialised circuits. Attention is concentration to realisation of the modulators and circuit of the numerical conversion of the signal, algorithms coding/decoding, which contains in the communication chain. Dominantly is concentration to effective realization with minimal computing power.			
A0M37DIP	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
A0M37DUP	Satellite navigation systems	Z,ZK	4
Existing, future and past radio satellite navigation systems. Course is addressed to students without knowledge of radio engineering. Attention is paid to measurements and practical tasks in laboratory and to experimental receiver programming.			
A0M37MOT	Advanced areas in image and video technology	KZ	5
This course presents the state-of-the-art techniques for digital image and video technology. These techniques and their applications cover almost all areas of technical professions dealing with human interaction. The content of lectures is being updated rapidly and continuously according to a remarkable progress in this field. The course deals with the principal functional blocks of mentioned systems both hardware and software implemented.			
A0M37SEK	Synchronization and equalization in digital communications	Z,ZK	4
We explain principles of the receiver signal processing (synchronization and equalization) for the parametric channel including variety of the implementation possibilities. We focus on the essential particular forms of the channel phase, frequency and timing parameterization, channels with multipath propagation and MIMO channels. We develop the ideas of synchronization and equalization in the context of the data decoding in the parametric channel. All basic categories of the CSE algorithms are targeted: feed-forward, feed-back, iterative and recursive, including the theoretical background of the parameter estimation theory, and theory of the feed-back and iterative systems.			

A0M37ZV2	Audio Technology 2	Z,ZK	4
This course deals with advanced topics related to audio technology in recording studios, namely room acoustics, multichannel signal recording and reproduction, digital audio signal processing, its impact on auditory perception, audio signal optimization from the psychoacoustic point of view. Measuring methods related to these topics are also presented.			
A0M38DIP	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
A0M38MAP	Magnetic Elements and Magnetic Measurements	Z,ZK	5
Measurement of magnetic field, NMR. Typical soft and hard magnetic materials. Measurement of properties of soft and hard magnetic materials. DC and AC magnetised circuits, circuits with permanent magnet. Current and voltage instrument transformers, current comparators. Sources of magnetic field. Magnetic shielding.			
A0M38MET	Metrology	Z,ZK	5
After a brief description of the role of the most important domestic and foreign metrological organizations and institutions, explanation is focused on units of measurable quantities and possibilities of their definition, realization, conservation and reproduction by means of measurement standards. After that, attention is paid to measurement methods and techniques for evaluating and increasing measurement accuracy. Facilities and methods applicable to precision measurements of both active and passive electrical quantities are described.			
A0M38OSE	Image Sensors	Z,ZK	5
This course explains the topics of optoelectronic image sensors, especially CCD and CMOS sensors, optical system, illuminators and their application in the computer vision.			
A0M39DIP	Master Thesis	Z	25
A0X36MOOC	Massive Open Online Course	Z	2
See https://cw.fel.cvut.cz/b172/courses/a0x36mooc/start for additional details.			
A1M01MPE	Mathematics for Economy	Z,ZK	6
Aim of this subject is to give the basic informations about probability, mathematical statistics and Markov chains and to show their applications, mainly in insurance mathematics. At the end of the course, bases of cluster analysis will be shown.			
A1M01MPS	Probability and Statistics	Z,ZK	8
The course covers probability and basic statistics. First classical probability is introduced, then theory of random variables is developed including examples of the most important types of discrete and continuous distributions. Next chapters contain moment generating functions and moments of random variables, expectation and variance, conditional distributions and correlation and independence of random variables. Statistical methods for point estimates and confidence intervals are investigated.			
A1M13EMP	Ecology of materials and processes	Z,ZK	5
Electrical Technology from the perspective of ecology. Environmental assessment of the various types of surface protection. Environmental aspects of protective systems used in electronics. Environmental impacts of electrical production. Ekodesign proposal of the electrical product. Principles of the proposal product for a difficult operating environment. Disposal of electrical waste.			
A1M13EFZ	Electrochemical Sources and Photovoltaics	Z,ZK	5
Photovoltaic sources. Operating principles, characteristics. Solar modules, construction and technology. Basic types of photovoltaic systems and their applications. Electrochemical sources of the electric power - overview. Primary cells and accumulators. Methods of accumulator charging. Sources for electrochemical production processes and their control. Automotive applications. Environmental aspects of the electrochemical sources and production processes.			
A1M13JAS	Quality and Reliability	Z,ZK	5
Terminology and definitions from the area of quality and reliability and their control, philosophy of quality, systems of quality control in the world. Reliability as a part of quality. Basic definitions from the area of reliability, basic distributions used in reliability and their basic characteristics. Back-up using a warm and cold standby, types of warm and cold standbys. Reliability of components and systems, calculation of reliability using composition and decomposition. and using a method of a list. Basic statistical methods and tools joined with quality control, managerial tools for quality control. Techniques FMEA and QFFD, house of quality. Capability of a process. Taguchi loss function. Audits. Statistical inspection.			
A1M13SVS	Simulation of Production Sytems	Z,ZK	5
The course is focused at methods of static and dynamic models of processes and systems forming. Basic types of models are described and characterized. Models are built up using an analytical way on the basis of knowledge of relationships between parameters, or using an experimental way. Factorial experiments for qualitative variables are presented. Computer aided generation of mathematical models and simulation of dynamic behavior of processes and systems are described. Basic methods of component models compilation, assembly of a complete model are presented. The application on computer modeling and simulation of electrical, thermal and mechanical systems in power electrical engineering completes the lectures.			
A1M13TPR	Technological Project Planning	Z,ZK	5
What is a project management? What is a life cycle of product and project? Project phases: Initial, Construct, Delivery and Support. Organisational structure. SWOT, PEST and 5P analyses. Workflow and business processes. Schedule, GANTT, PERT. Enterprise and project modelling. Management of documentation, recourses, quality and knowledge. Standards for exchange of product and business data. Enterprise ontology.			
A1M13VES	Manufacturing of Electrical Components	KZ	4
Technology of electric components in general. Basic technology in use. Type of components: resistors, potentiometers, capacitors with foil dielectric. Ceramic and electrolytic capacitors. Electromechanical devices . Semiconductors, fabrication of vertical and horizontal structures. Packaging.			
A1M13VEZ	Manufacturing of Electronic Equipment	Z,ZK	5
Mechanical and electrical design. The electric contact. Joining of conductors. Cooling of components and equipment Printed circuit boards fabrication. Soldering in electronics. Electromagnetic compatibility of electronic equipment. Protection of components and equipment, sensitive on electrostatic field. Certification, accreditation, quality control and quality assurance.			
A1M14ESZ	Power Machine Equipment	Z,ZK	4
Analysis of basic functions and operational accidents for power engineering. Quantitative and qualitative balance energy of machine equipment. Analysis of influence breakdowns of machine equipment, modes of regulation power output of power machine equipment. Operating optimisation. Operation properties of power machine equipment of power plant.			
A1M14PO2	Electric Drives and Traction 2	Z,ZK	5
Electro mobiles and hybrid cars. Tire train and rolling resistance. Adhesion. Traction power. Locomotive traction power calculation for defined train load and track. Mass transportation vehicles. Tramway with resistive control, pulse control and induction motors. Tramway power-electronic converters. Trolley-busses. Metro. Electric locomotives - various designs. Locomotive power-converters. DC, AC and multi-system locomotives. AC motor locomotives. Diesel-electric locomotives			
A1M14RPO	Electric Drive Control	Z,ZK	5
Controlled electric drive, control computer of electric drive - system view, modulation methods, scalar control, quantity transformation, FOC control, DTC control, compatible rectifier, servo-drives, digital signal processing, discrete function, difference equation, digital filters, digital controllers, PSD controller, derivation and difference equation coefficients calculation, fixed point and floating point calculations, relative units and quantity normalization, digital signal processors, modulator hardware support, control algorithm implementation, microprocessor control system hardware implementation, protection circuitry, debugging, testing and monitoring			
A1M14SOP	Simulation and Optimization in Drives	Z,ZK	5
Models of dynamic systems. Methods and process of simulation. Programs Pspice, Schematics and Probe. Circuit models of semiconductor converters. Dynamic models of converters in average values. Electric drive as a system. State space representation of models and its solution. Numerical methods and optimization. Models of converters and machines for high			

frequencies. Programs Matlab, Simulink. Methods of finite elements and its use for magnetic field optimization in electric machine. Development process and SW tools for design of main types of electric machines			
A1M14SP2	Electric Machinery and Apparatus 2	Z,ZK	5
Contacts and semiconductor switching apparatus in LV networks. Basic topology of 3-phase switches and power load of its components. Power switches and systems with progressive semiconductor devices and its control circuits. Protective circuits of semiconductor switching devices. Electric apparatus testing. Continue. Fundamentals of general theory of electric machine. Magnetic field. Fundamentals of commutation. Transformer, efficiency, volt drop. Transient phenomena - switch to the network, cut-off. Mathematical model of synchronous and induction machine. Rotating magnetic field. Induction machine, starting and speed control. Magnetic field harmonics and their influence. Single-phase induction motor. Operation of the synchronous machine on the network. Torque, stability, overload capacity. Transient phenomena, cut-off			
A1M14SSE	Machinery structures of power plants	Z,ZK	4
The aim of subject is to acquaint with natural relations of energy conversions at power-producing premises, to describe functions of power-producing equipment, their structure, properties and characteristics.			
A1M14VE2	Power Electronics 2	Z,ZK	5
Rectifiers with active load, discontinuous and continuous current, multiple commutation, three-phase AC/AC converters, electrostatic separators, welding rectifiers, battery chargers, superconductive magnetic energy reservoir, induction heating, reactive power compensation, contactless switches, softstarters, resistor pulse control, cathodic prevention, power transistor in switching mode, snubbers, structure and control principles of modern controlled drive, pulse width modulation methods, principles of vector control and direct control, pulse width modulated rectifiers, matrix converters, converter protection against current overload and against overvoltage			
A1M15ENY	Power Plants	Z,ZK	5
The subject introduces power plants of all kinds dimensioning and functions. It describes diagrams topologies, operational modes, control and safety problems solutions. It models dynamics and control of main part in all power plants types. It evaluates and describes control qualities and programmes.			
A1M15EST	Electrical Light and Heat	Z,ZK	5
The aim of the first part of the course is to make students acquainted with most frequent applications of optical radiation, modern photometric and colorimetric devices used in practice, fundamentals of light control and design of dynamic lighting including new trends in light sources and luminaire progress. The aim of the second part of the course is to become students acquainted with heat transfer laws, heat pumps and problems of global optimization on electrical power engineering.			
A1M15PRE	Transmission and Distribution of Electricity	Z,ZK	5
The subject gives a complex overview about the electricity transmission and distribution task. It deals with particular elements technical parameters and gives information about the total behaviour in steady and transient states. Students are informed about supporting devices enabling safe and reliable operation.			
A1M15RES	Control of Power Systems	Z,ZK	5
The subject introduces electrification system physical and economical characteristics and models. It deals with modes optimization, active and reactive power control in isolated and interconnected systems, extraordinary states solving and reliability evaluation. It describes also the current situation of the energy market liberalization and sources operation in it.			
A1M15TVN	High Voltage Engineering	Z,ZK	5
The subject introduces students with high voltage technique from point of view of its application in power engineering. It brings information about high voltage testing sources and the possibilities of measuring high voltages and big currents. It informs about high voltage insulation systems and methods for determining their states. There are explained particular types of electrical discharges and the possibilities of their elimination. Practical seminars are based on measurements in the high voltage laboratory.			
A1M16CTR	Controlling	Z,ZK	6
Course primary objective is in introducing the Management Control (Controlling) as the up-to-date approach to management of the organization (enterprise, institution). To explain its changing role in management on its development in past decades from functional form, over reporting period, to integral concept of the management control of the organization. Both points of view - the recent theoretical bibliography and context of advanced practice are considered. The course focuses on key linkages among functional areas, key processes and activities in management control system. The course deals with managerial methods and other managerial tools to be applied in management of single entities of management control system and in their interrelated actions.			
A1M16DES	Power Transport Systems	Z,ZK	5
Economical aspects of energy transport. Electricity transportation through lines. Heat, gas and oil lines. There are ment also universal transport systems as railway, roads and ships with considering of energy transport. After technical introduction it is dealt with problems of economical design of transport lines and economical operation			
A1M16EKL	Ecology and economy	Z,ZK	5
Development of environmental protection. Sustainable development. Global environmental problems and their aspects. Greenhouse effect and climate changes. Fossil fuels, nuclear fuel cycle and environmental impacts. Support schemes for renewable energy sources utilization. Economic effectiveness of renewable energy sources projects. Regulatory and economic instruments for economic activities regulation. Externalities. Environmental indicators.			
A1M16EUE	Economy of Energy Use	Z,ZK	5
Organization and energy management of company, buildings or energy systems. Energy need and consumption, energy balance. Energy characterization of aggregate, secondary energy sources. Energy audit and feasibility study, optimization of energy management of energy systems. Prices and tariffs, economy and financial analysis.			
A1M16FIM	Financial Management	Z,ZK	6
Principles of finance, present value and alternative cost of capital, net present value, valuation of bonds and stocks, investment decision and net present value, risk and alternative cost of capital, risk and return, lease or buy, taxes, inflation and return, financial and real options, option valuation and application, hedging, short term finance, cash flow management.			
A1M16FIU	Financial Accounting	Z,ZK	5
Principles of accounting. Assets, inventory and financial investment book keeping. Debt and equity capital. Cost, revenues and profit. Tax system and accounting. Balance sheet, profit and loss account. Cash flow statement. Analysis of company's financial position. International accounting standards. Auditing, consolidated statements.			
A1M16JAK	Quality management	Z,ZK	5
Concept of Quality, History of quality management (QM), Current approaches to QM, Approach to quality in EU and CR, Quality management system (QMS) based on ISO 9001, Process management, Quality planning, Metrology in QM, Control of documents and records, Internal audits of QMS, Continual improvement of QMS, Integrated management, Statistic methods in QM, Accreditation and certification			
A1M16LOG	Business Logistics	Z,ZK	5
Logistics as an integrated system in the structure of business management. Logistics as a part of business strategy. Fundamentals of modern concepts and approaches in logistics. Management, cooperation in supply chain logistics, integrated control systems. Methods applied to flow control and evaluation of elementary parameters of logistics. Logistics market. Logistics integration including its legal, ecological and economical aspects.			
A1M16MAR	Marketing	Z,ZK	5
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. Marketing-mix. Product and service policy, pricing and contractation policy, communication, distribution. Controlling and audit.			
A1M16MAV	Production Management	Z,ZK	5
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.			
A1M16MEE	Management of Power Production	Z,ZK	5
Power plants and mining industry management and economics, energy balances and costs calculations of power production - electricity, steam, hot water, coal, liquid fuels, gas, economic loading of power plants, cost analysis			

A1M16MES	Management and Economics of Power Systems	Z,ZK	6
This course will give an overview of the various aspects of power supply with special emphasis on power management. The course characterises energy costs and marginal costs for determination of prices and tariffs. Energy market principles and operational decision making are integral parts of the course as well.			
A1M16OVY	Operations Research	Z,ZK	5
Art of modeling and elements of decision models, Linear programming, Transportation problem, Integer linear programming, Introduction to graphs theory, Nonlinear programming, Dynamic programming, Monte Carlo simulation, Project management (CPM, PERT).			
A1M16PMG	Project Management	KZ	5
Processes and techniques for the preparation of entrepreneurial projects. Principles and methods of planning and operating of projects realization. Operating of the integration and project area. Operating of time, costs, sources, duality, human sources, communication, risks. Case study in the program Microsoft Project.			
A1M16RES	Development of Energy Systems	Z,ZK	5
A1M16SIR	System Analysis and Decision Making	Z,ZK	5
System approach and decision making, Decision models, Games theory, Decision making under uncertainty and risk, Decisions with multiple objectives, Stochastic programming, Expert systems.			
A1M16STA	Statistical methods in economics	Z,ZK	5
Basic Concepts. Statistical series. Assortment. Distributions of frequencies. One-dimensional descriptive characteristics. Measures of variables, coefficient of skewness, coefficient of excess. Points estimates of basic characteristics. Interval estimates of basic characteristics. Hypothesis testing of basic characteristics. Individual indexes number. Aggregative indexes. Variable-structure indexes. Multifactor indexes. Correlation and regression, Basic Concepts. Measurement of dependence intensity. Time series, concepts, qualities. Chronological average. Time series - trends and extrapolation.			
A1M16VEN	Power and Heat Production	KZ	5
Power sources, energy processes, general power plant, power balance and characteristic curves. Review of energy production technologies (conventional and non conventional) - electricity, steam, hot water, coal, liquid fuels, gas. Power generation stations, their basic parts, their basic operational characteristic curves and calculations, operation, control. Environmental effects of power generating and actions of their minimization.			
A1M32TSY	Telecommunication Systems	Z,ZK	4
The subject discusses telecommunication networks from different perspectives - physical principles, structure, applications, etc. Students are introduced to elementary concepts and principles in the area of communications. The presented principles and methods are illustrated using examples of specific communication networks - ISDN, data transmission networks, fixed as well as mobile ones. Emphasis is put on applications related to power lines.			
A2M01PMS	Probability and Statistics	Z,ZK	8
The course covers probability and basic statistics. First classical probability is introduced, then theory of random variables is developed including examples of the most important types of discrete and continuous distributions. Next chapters contain moment generating functions and moments of random variables, expectation and variance, conditional distributions and correlation and independence of random variables. Statistical methods for point estimates and confidence intervals are investigated.			
A2M17AEK	Antennas and EMC in Radiowave Communication	Z,ZK	5
Student obtains the knowledge of basic analysis and design of the individual type of the antennas (wire, planar, reflector and lens antennas, and radomes) and antenna arrays. He obtains the basic experience in antenna and communication technique, antenna measurement technique including training in specialized antenna anechoic laboratory. He also obtains the basic knowledge in the field of electromagnetic compatibility - electromagnetic interference and susceptibility including testing methods and criteria of selecting of antennas for given fixed, mobile, ground and satellite service.			
A2M17BP3	Safety in Electrical Engineering 2	Z	
The purpose of the course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it, safety work with electrical equipment, basics of the first aid at injury by electric current. Students receive qualification that enables them to work on electrical equipment which is necessary for their work in the Faculty of Electrical Engineering, Czech Technical University (Dean's order No. 1/2007).			
A2M17IND	Individual Project	KZ	6
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject. Projects deals with microwave technique, antennas, propagation, optical communications, EMC, and medical applications.			
A2M31IND	Project	KZ	6
A2M31SMU	Signals in multimedia	Z,ZK	5
Course brings information about methods of signal processing used in multimedia including 2-D analysis and modern methods.			
A2M31ZRE	Speech processing	Z,ZK	6
The subject is devoted to basis of speech processing addressed to students of master program with special focus on multimedia applications. Discussed speech technology is currently applied in many systems in different fields (e.g. information dialogue systems, voice controlled devices, dictation systems or transcription of audio-video recordings, support for language teaching, etc.). Further information can be found at http://noel.feld.cvut.cz/vyu/a2m31zre . Detailed information for registered students can be found at teaching portal http://moodle.kme.feld.cvut.cz .			
A2M32IND	Individual Project	KZ	6
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.			
A2M32MKS	Mobile Communication Networks	Z,ZK	4
The goal of the course is to provide an overall overview of mobile communications in the variety of analog and digital systems. The main emphasis is put onto contemporary GSM network (including new supplementary technologies) and onto the transition towards 3rd generation networks (UMTS, LTE, ...). It also deals with the area of mobile communications based on employment of telecommunication satellites; public and private radio / paging systems and radio networks are discussed as well.			
A2M34IND	Individual Project	KZ	6
Independent work in the form of a project. A student will choose a topic related to his or her branch of study, which will be specified department or branch departments. The project will be defended within the framework of a subject.			
A2M34MIM	Microsystems in Multimedia	Z,ZK	5
The subject solves systems working in interdisciplinary areas, the most frequently in the energy interface - optical, thermal, mechanical, electrical). There are explained physical principles of any sensors, especially of optical and mechanical quantities, principle of biometric pick-up information, principle of tactile display, etc. There re solved the basic methods of the signal pre-processing. Basic principles of actuators are described, ones are using for the control in instruments and systems of multimedia applications. The attention is focused on MEMS elements and systems and their applicability in modern instrument technology.			
A2M34SIS	Integrated System Structures	Z,ZK	5
Design methodologies of analog, digital and optoelectronics integrated systems. Description of integrated circuits fabrication process; CMOS technologies and its modern sub-micron trends; design rules and layout design. Design and fabrication process of micro-electro-mechanical systems (MEMS); polymer based technologies; optical and optoelectrical integrated circuits, fabrication process and technologies, materials, design and testing.			

A2M37DKM	Digital communications	Z,ZK	4
The course focuses on the area of digital modulation, coding and physical layer signal processing in communication systems. The exposition is systematically built along the theoretical line which allows to reveal all inner connections and principles. This allows the students to develop the knowledge in an active way and use it in a design and construction of the communication systems. In a broad area of the digital communications, we focus on the essential principles. Those are further extended in the optional courses.			
A2M37IND	Individual Project	KZ	6
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.			
A2M37OBT	Image Technology	Z,ZK	6
This course deals with multimedia technology and it is focused mainly on acquisition, processing and reproduction of image information. It covers area of measurements in photometry, radiometry and colorimetry; design of objective lenses, image sensors and displays including their parameters. Further the course deals with cinematography, photography and with other special methods of image reproduction, e.g. polygraphy and digital printing techniques. Studied problems are completed with explanation of advanced methods of image processing (preprocessing, compression, image reconstruction, etc.).			
A2M37ZVT	Audio Technology	Z,ZK	5
The course deals with topics from electro acoustics, sound reinforcement, related signal processing in conjunction with psychoacoustic aspects. It prepares experts for studio practice, design of sound reinforcement and specialized field in signal processing.			
A2M99CZS	Digital Signal processing	Z,ZK	5
The subject gives overview about basic methods of digital signal processing and their applications (examples from speech and biological signal processing): discrete-time signals and systems, signal characteristics in time and frequency domain, Fourier transform, fast algorithms for DFT computation, introduction to digital filter design, digital filtering in time and frequency domain, decimation and interpolation and their usage in filter banks, basics of LPC analysis.			
A2M99MAM	Microprocessors and microcomputers	Z,ZK	6
The aim is to make students acquainted with the properties of microprocessor systems, make students familiar with on-chip peripherals, connect external circuit to the processor bus, and with implementation of the memory or I/O space address extension. Next, taught the students to make simple program in the assembly language, C language and combination of both. After completion of this subject student should be able to design and implement simpler microprocessor system including connection of necessary peripherals and software design.			
A3M01MKI	Mathematics for Cybernetics	Z,ZK	8
The goal is to explain basic principles of complex analysis and its applications. Fourier transform, Laplace transform and Z-transform are treated in complex field. Finally random processes (stacinary, markovian, spectral density) are treated.			
A3M33IRO	Intelligent robotics	Z,ZK	7
The subject teaches principles allowing to build robots perceiving surrounding world and activities in it including the abilities to modify it. Various architectures of robots with cognitive abilities and their realizations will be studied. Students will experiment with robots in practical assignments. Studied material is applicable more widely while building intelligent machines.			
A3M33MKR	Mobile and Collective Robotics	Z,ZK	6
The course introduces basic mobile robot structure design together with control methods aimed to achieve autonomous and collective behaviors for robots. Methods and tool s for data acquisition and processing are presented herein with the overall goal to resolve the task of autonomous navigation for mobile robots comprising the tasks of sensor fusion, environmental modeling including Simultaneous Localization And Mapping (SLAM) approaches. Besides sensor-processing related tasks, methods for robot trajectory planning will be introduced. The central topic of the course stands in specific usage of the afore methods capable of execution with groups of robots and taking the advantage of their cooperation and coordination in groups. Labs and seminars are organized in a form of an Open Laboratory whereas the students will resolve the given problem in simulated environments as well as with a real robot HW.			
A3M33PRO	Advanced robotics	Z,ZK	6
We will explain and demonstrate techniques for modelling, analyzing and identifying robot kinematics. We will explain more advanced principles of the representation of motion in space and the robot descriptions suitable for identification of kinematic parameters from measured data. We will explain how to solve the inverse kinematic task of 6DOF serial manipulators and how it can be used to identify its kinematic parameters. Theory will be demonstrated on simulated tasks and verified on a real industrial robot.			
A3M33UI	Artificial Intelligence	Z,ZK	6
The course is aimed at providing theoretically deeper knowledge in the area of Artificial Intelligence in the extent needed to study the branch of study Robotics. It is organized around several topics: pattern recognition and machine learning, theory of multi-agent systems and artificial life. The linkage between the theoretical and practical applications is rather stressed.			
A3M35NES	Nonlinear Systems and Chaos	Z,ZK	6
A3M35OFD	Estimation, filtering and detection	Z,ZK	6
This course will cover description of the uncertainty of hidden variables (parameters and state of a dynamic system) using the probability language and methods for their estimation. Based on bayesian prblem formulation principles of rational behaviour under uncertainty will be analysed and used to develop algorithms for estimation of parameters of ARX models and Kalman filtering including the extensions. We will demonstrate numerically robust implementation of the algorithms applicable in real life problems for the areas of industrial process control, robotics and avionics. We will extend the methods for linear gaussian systems to a more generic problems using Monte Calro approach. The course will also cover multimodel approach and its use for the fault detection and isolation and introduction to adaptive control.			
A3M35ORR	Optimal and robust control	Z,ZK	6
This advanced course will cover modern methods for optimal and robust control design. Emphasis will be put on practical computational design skills and realistic application problem formulations. Unifying concept of this course is that of minimizing a system norm. Depending on which norm is minimized, different properties of the resulting controller are guaranteed. Minimizing the H2 system norm leads to the celebrated LQ/LQG optimal control trading off the performance and the effort, while minimizing H∞ norm shifts the focus to robustness against uncertainties in the model. ?-synthesis is an extensions to the H∞ optimal control design methodology than takes the structure of the uncertainty into consideration. Methods for time-optimal and suboptimal control will be presented as well as they proved useful in applications with strict time constraints like positioning of a hard disk drive RW head. As a self-contained add-on to the course, introduction to the topic of semidefinite programming and linear matrix inequalities (LMI) will be made, as these constitute a very elegant theoretial and a powerful computational tool for solving all the previously introduced tasks in optimal and robust control. Methods for reduction of model and controller order complete the course.			
A3M35PSR	Real-Time Systems Programming	Z,ZK	6
The goal of this subject is to give students basic knowledge in the area of software design for embedded systems with real-time operating systems (RTOS) with emphasis to practical experience. Students will solve several simple tasks to get basic knowledge about RTOS VxWorks and to measure timing parameters of the RTOS and hardware, which are necessary when choosing a platform for a given application. Then a more complicated task (motor control) will be solved, which will fully utilize means of RTOS VxWorks. During lectures, students will become familiar with real-time systems theory, which can be used to formally prove the timing correctness of the applications. Moreover, some software engineering techniques, which help with increasing of quality of safety-critical systems will be discussed.			
A3M35RIS	Control Systems	Z,ZK	6
Process control using industrial control systems, programmable logic controllers, visualisation of technological processes. Hierarchical control systems, industrial communications for factory and process automation. Open software technologies, safety and reliability of control applications.			
A3M35TDS	Theory of Dynamical Systems	Z,ZK	8
The purpose of this course is to introduce mathematical tools for the description, analysis, and partly also synthesis, of dynamical systems. The focus will be on linear time-invariant multi-input multi-output systems and their properties such as stability, controllability, observability and state realization. State feedback, state estimation, and the design of stabilizing controllers will be explained in detail. Partially covered will be also time-varying and nonlinear systems. Some of the tools introduced in this course are readily applicable to engineering			

problems such as the analysis of controllability and observability in the design of flexible space structures, the design of state feedback in aircraft control, and the estimation of state variables. The main motivation, however, is to pave the way for the advanced courses of the study program. The prerequisites for this course include undergraduate level linear algebra, differential equations, and Laplace and z transforms.

A3M38DIT	Diagnostics and Testing	Z,ZK	7
The course introduces the fundamentals of the fault-diagnosis and testing systems, machine condition monitoring, vibrodiagnostics and advanced signal processing methods, non-destructive testing and testing of analog and digital circuits. In laboratory will be demonstrated selected diagnostic tools, and solved an individual project related to diagnostics and/or testing.			
A3M38MSZ	Modern Sensors and Signal Processing	Z,ZK	6
The course is aimed to broaden the sensors basics by topics necessary for design of sensors and sensor systems. Prospective sensor types are covered as well as methods of the processing of the sensor signal. Sensors and sensor systems are shown in applications and by case design studies. The labs are concentrated to the complex measurement of the sensor parameters and to FEM modeling and its experimental verification. Optical sensors and their applications are covered in detail by following course "Videometry".			
A3M38SPD	Data Acquisition and Transfer	Z,ZK	6
Subject is devoted to distributed and centralized DAQ systems and to the design of their elements. Selected industrial interfaces and buses (CAN, Profibus, HART, Modbus, Ethernet), VXI/PXI systems, USB and wireless sensor networks (ZigBee, WiFi) are presented in detail in order to provide information required for efficient design of their components. Project-oriented laboratories provide students with practical experience in the implementation of modern DAQ systems.			
A3M38VBM	Videometry and Contactless Measurement	Z,ZK	6
This course explains the topics of optoelectronic sensors, especially CCD sensors, and their application in the videometry based contactless measurements. The problems of CCD line and area sensors, design of measuring cameras and the methods of signal processing are presented.			
A3M38VIP	Virtual Instruments	Z,ZK	6
A subject deals with programming virtual instruments based on standardized interfaces (PCI, PXI, VXI). Lectures are focused on application of up-to-date standards for data acquisition systems programming (VXIplug&play, VISA, IVI) and selected software techniques in Windows and Linux operating systems. Assigned software tasks in laboratories are solved using C/C++ language or LabVIEW environment.			
A3M38ZDS	Analog Signal Processing and Digitalization	Z,ZK	6
The course is dedicated to methods for preprocessing, digitalization and reconstruction of continuous signals. It is focused to the methods for achieving of high precision of transmission and suppression of spurious components. The laboratory exercises are divided into two parts: the first part is classical tasks; the second one is individual project of design of typically data acquisition system. The teaching is supported by the CAD system for measuring circuits.			
A3M99PTO	Team Work	KZ	6
The aim of this course is to get the students knowledgeable to work in teams. How to manage the team and methodology of the team work will be guided by specialists from the industry during lectures. Students will be working on real problems during labs.			
A4M01TAL	Theory of Algorithms	Z,ZK	6
The course brings theoretical background of the theory of algorithms with the focus at first on the time and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of complexity; the classes P, NP, NP-complete, PSPACE and NPSpace are treated and properties of them investigated. Probabilistic algorithms are studied and the classes RP and ZPP introduced.			
A4M33AU	Automatic Reasoning	Z,ZK	6
Theorem proving is no more restricted to mathematics, but it is ever more often used in situations, when one needs to make sure that the suggested procedure meets the initial requirements it is used in deductive databases as well as for verification of SW or HW components. The process of proof construction has to be automated for that purpose. The course reviews current systems of 1st order theorem proving and their practical applications. There are explained underlying theoretical principles (model checking, resolution, tableaux) together with their practical and theoretical constraints. Special attention is devoted to gaining experience in choosing the best tool to solve a specific problem, in identification of mistakes in input or in strengthening the obtained results.			
A4M33BIA	Bio Inspired Algorithms	Z,ZK	6
The students will learn some of the unconventional methods of computational intelligence aimed at solving complex tasks of classification, modeling, clustering, search and optimization. Bio-inspired algorithms take advantage of analogies to various phenomena in the nature and society. The main topics of the subject are artificial neural networks and evolutionary algorithms.			
A4M33DZO	Digital image	Z,ZK	6
First, the subject teaches how to process two-dimensional image as a signal without interpretation. Image acquisition, linear and nonlinear preprocessing methods and image compression will be studied. Second, image segmentation and registration methods will be taught. Studied topics will be practised on practical examples in order to obtain also practical skills.			
A4M33MPV	Computer Vision Methods	Z,ZK	6
The course covers selected computer vision problems: search for correspondences between images via interest point detection, description and matching, image stitching, detection, recognition and segmentation of objects in images and videos, image retrieval from large databases and tracking of objects in video sequences.			
A4M33NMS	Design and Modeling of Software Systems	Z,ZK	6
The subject introduces to the design process of a software system from requirements gathering to a detailed object-oriented design. It is based on existing development methodologies, especially object-oriented, and the UML language will be used as a dominant formalism. The subject is oriented mainly on reliability analysis and formal and informal methods to reduce error rate in design phases.			
A4M33PAL	Advanced algorithms	Z,ZK	6
Basic graph algorithms and graph representation. Combinatorial algorithms. Application of formal languages theory in computer science - syntax analysis and pattern matching.			
A4M33RZN	Advanced Methods for Knowledge Representation	Z,ZK	6
This course aims to deepen understanding of knowledge representation principles beyond the predicate logic formalism. Firstly, the course presents ontologies and description logic, the principle elements of semantic web. Then, attention will be paid to statements whose validity varies in time. Uncertainty makes the next issue to be discussed. Modal logic extends the classical logic with additional modalities, namely, possibility, probability, and necessity. Probabilistic graphical models associate the classical probabilistic theory with the graph theory. Fuzzy sets allow to represent vagueness.			
A4M33SAD	Machine Learning and Data Analysis	Z,ZK	6
The course explains machine learning methods helpful for getting insight into data by automatically discovering interpretable data models such as graph- and rule-based. The course will also address a theoretical framework explaining why/when the explained algorithms can in principle be expected to work. The lectures are given in English.			
A4M33TDV	3D Computer Vision	Z,ZK	6
This course introduces methods and algorithms for 3D geometric scene reconstruction from images. The student will understand these methods and their essence well enough to be able to build variants of simple systems for reconstruction of 3D objects from a set of images or video, for inserting virtual objects to video-signal source, or for computing ego-motion trajectory from a sequence of images. The labs will be hands-on, the student will be gradually building a small functional 3D scene reconstruction system.			
A4M33TVS	Software Verification and Testing	Z,ZK	6
This course will introduce the theoretical foundations and mathematical concepts necessary for rigorous software testing, including the definitions of fundamental system characteristics, such as reliability, robustness and correctness of the software system. We will emphasize the techniques and abstract tools necessary for validation of the correctness and reliability characteristics of the software. In the first part of the course, we will introduce the existing techniques and paradigms for system testing (black/white box, formal methods, structural analysis), including the methods for test number reduction and automation. The second part of the course will concentrate on formal methods for system verification. We will introduce			

the formal frameworks necessary for the dynamic description of system properties (Z-notation, temporal logic) and the applicable verification methods (model checking, theorem proving) working on these representations.			
A4M33TZ	Theoretical foundations of computer vision, graphics, and interaction	Z,ZK	6
We will explain fundamentals of image and space geometry including Euclidean, affine and projective geometry, the model of a perspective camera, image transformations induced by camera motion, and image normalization for object recognition. Then we will study methods of calculating geometrical objects in images and space, estimating geometrical models from observed data, and for calculating geometric and physical properties of observed objects. The theory will be demonstrated on practical task of creating mosaics from images, measuring the geometry of objects by a camera, and reconstructing geometrical and physical properties of objects from their projections. We will build on linear algebra, probability theory, numerical mathematics and optimization and lay down foundation for other subjects such as computational geometry, computer vision, computer graphics, digital image processing and recognition of objects in images.			
A4M34ISC	Systems on Chip	Z,ZK	6
Main responsibilities of integrated circuits designer; design abstraction levels - Y chart. Specification designation, feasibility study, criteria for technology and design kits selection. Analogue and digital integrated systems design and simulation methodologies. Main features of application specific ICs - full custom design, gate arrays, standard cells, programmable array logic. Design aspects mobile and low power systems. Hardware Description languages (HDL). Logic and physical synthesis. Front End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenche construction and verification.			
A4M35KO	Combinatorial Optimization	Z,ZK	6
The goal is to show the problems and algorithms of combinatorial optimization (often called discrete optimization; there is a strong overlap with the term operations research). Following the courses on linear algebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programming, heuristics, approximation algorithms and state space search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, planning of human resources, scheduling in production lines, message routing, scheduling in parallel computers.			
A4M35OSP	Open-source programming	Z,ZK	6
The subject provides insight into world of open-source projects and techniques proved to be usefull for larger applications and operating systems development. Reasons leading to the founding of GNU project is discussed and possible advantages of this approach for cooperation even for commercial subjects is shown. Usual tools used for development, debugging and source code control and functional testing are described. Description of POSIX type operating system structure and introduction to the driver development, user-space libraries and user graphics environments comes next. The last topic is introduction how to use earlier described techniques and support for embedded applications development and real-time control.			
A4M36AOS	Service Oriented Architectures	Z,ZK	6
The lecture focuses on service-oriented computing (SOC) and service-oriented architecture (SOA). Basic concepts of SOC will be explained on the service level (service description, discovery and invocation) and process level (business process formalization, service composition, transaction mechanisms) with respect to SOC utilization for flexible business applications implementation in (semi-)open environment (intra- i inter-enterprise). Besides basic web-services specifications and technologies (SOAP, WSDL, UDDI, BPEL) the up-to-date technologies for semantic web-services will be introduced. Great emphasis will be put on representation and modeling formalisms (RDF, RDFS, OWL). Open environment operation aspects will be also presented (reputation, trust, quality-of-service, privacy). The goal of the course is to bring general overview, but particular SOA platforms and tools (Sun Glassfish, JBoss) will be also introduced including comparison to older distributed systems architectures (CORBA, DCOM) and related domain of multi-agent systems. The design methodology, implementation, and deployment will be explained with relation to existing business processes and organizational structures.			
A4M36MAS	Multiagent Systems	Z,ZK	6
This course provides foundations of multi-agent systems and agent technologies. It provides a formal model of an agent, the concept of reactive, deliberative and deductive agent, BDI architecture, basics of inter agent communication and coordination. Introduction to distributed decision making and game theory will be also provided.			
A4M36PAH	Planning and game playing	Z,ZK	6
This course provides an introduction to classical AI planning (linear, nonlinear planning, graph-plan planning, heuristic planning, SAT-based planning) and game-tree representation and methods of adversarial search (such as minimax and alpha/beta pruning).			
A4M36PAP	Advanced Computer Architectures	Z,ZK	6
This course extends knowledge of modern computer architecture. Mainly the architecture of nowadays processors utilizing instruction and/or thread level parallelism and advanced pipelining is in the center of our attention. A special emphasis will be devoted to the implementation of parallelism in hardware, parallel program design, and advanced instruction scheduling and execution.			
A4M38AVS	Embedded Systems Application	Z,ZK	6
This course presents applications of embedded systems and their specifics. It is expected that the students have had a programming course, and thus the course is more oriented on explaining and describing the blocks and functions of embedded systems and their use in signal processing, rather than writing code. After completing this course, students should have an overview of usability and power of available processors, and their peripherals, on the basis of which, they should be able to independently design embedded systems for a wide spectrum of applications.			
A4M38KRP	Computer Interfaces	Z,ZK	6
Students are acquainted with common computer interfaces and design of peripherals. Selected PC interfaces (USB, PCI, PCI Express, IEEE1394, ExpressCard), metallic and wireless networks (IEEE802.x standards) and industrial interfaces (EIA-485, EIA-232, CAN) are explained in detail. Project-oriented laboratories are focused on design and implementation of selected communication interface.			
A4M39APG	Algorithms of Computer Graphics	Z,ZK	6
In this course you will get acquainted with basic problems and their solutions in computer graphics. The main topic of the course are graphics primitives in 2D and 3D for modeling and rendering, color models, image representations, and basic photorealistic rendering algorithms.			
A4M39DPG	Data Structures for Computer Graphics	Z,ZK	6
This course provides you with the fundamentals of data structures commonly used in computer graphics. In contrast to standard binary search trees used in one dimension, the presented theory focuses on multidimensional data used to describe 3D scenes. In addition to the theory, the course emphasizes individual and team projects, where the importance and advantages of multidimensional data are demonstrated on practical examples. The students will gain practical experience through their own individual projects.			
A4M39MMA	Multimedia and Computer Animation	Z,ZK	6
The course is focused on methods often applied in the area of computer animation. Students will get an overview of algorithms and methods solving typical problems of 3D animation (inverse kinematics, animation of human body, dynamics, etc.). Part of the course is devoted to principles used during creative work with sound. The last part of lectures will give information about methods and technologies used in movie production (MOCAP, stereoscopy, visual effects).			
A4M39NUR	User Interface Design	Z,ZK	6
Students will get acquainted with the theory of human-computer communication and interaction (formal description of user interfaces, formal user models, the fundamentals of perception, cognition, and user information evaluation).			
A4M39VG	Computational Geometry	Z,ZK	6
The goal of computational geometry is analysis and design of efficient algorithms for determining properties and relations of geometric entities. The lecture focuses on geometric search, point location, convex hull construction for sets of points in d-dimensional space, searching nearest neighbor points, computing intersection of polygonal areas, geometry of parallelograms. New directions in algorithmic design. Computational geometry is applied not only in geometric applications, but also in common database searching problems.			

A4M39VIZ	Visualization	Z,ZK	6
In this course, you will get the knowledge of theoretical background for visualization and the application of visualization in real-world examples. The visualization methods are aimed at exploiting both the full power of computer technologies and the characteristics (and limits) of human perception. Well-chosen visualization methods can help to reveal hidden dependencies in the data that are not evident at the first glance. This in turn enables a more precise analysis of the data, or provides a deeper insight into the core of the particular problem represented by the data.			
A5M17BUP	Biological Effects of Electromagnetic Field	KZ	4
Biophysical Aspects of Electromagnetic Fields (EF) coupling of Various Biological Systems (BS). Interaction of EF with BS - overview. Mechanism of Interaction and Biological Effects. Experimental Results and Hypotheses of Biological Effects of Static and Stationary Electrical, Magnetic and Nonstationary Fields. Mathematical Solution of Interaction. EF generated by living Organism. Applications of EF in Medicine. Hygienic Standards.			
ADIP25	Diploma Thesis	Z	25
Independent final comprehensive work for the Master's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The diploma thesis will be defended in front of the board of examiners for the comprehensive final examination.			
AE0B04C0	Czech language 0	Z	2
The course is aimed towards ERASMUS students - especially beginners. The course is taught on the basis of English language support. The goal of the course is to give the students first hand information about pronunciation, vocabulary and grammar structure of the Czech language, and also provide them with basic useful phrases needed for everyday communication during their stay in the Czech Republic.			
AE0M33OSW	Ontologies and Semantic Web	KZ	4
The course "Ontologies and Semantic Web" will guide students through current trends and technologies in the semantic web field. Students will learn designing complex ontologies, thesauri, formalizing them in a suitable formal language, querying them and creating semantic web applications on their top. The second part of the course will be devoted to the efficient management of ontological data and other selected topics. All course materials are in English. In case all attendees are Czech speaking Czech can be spoken.			
AE2M34LPD	Low Power Design and Test of Circuits and Systems	Z,ZK	5
This course covers advanced VLSI design and test techniques for low power circuits. Topics covered include aspects of the design of low voltage and low power circuits including process technology, device modeling, CMOS circuit design, memory circuits and subsystem design. Course also covers aspects of testing and reliability of low power circuits and systems. Various types of defects observed in practical designs will be discussed. Focus will be also on on- and off-chip techniques for defect detection, failure analysis and diagnosis. This will be a research- oriented course based on team projects.			
TV-V1	Physical education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0

For updated information see <http://bilakniha.cvut.cz/en/f3.html>

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