

Study plan

Name of study plan: Elektrotechnika, energetika a management - Technologické systémy

Faculty/Institute/Others: Faculty of Electrical Engineering

Department: Department of Electrotechnology

Branch of study guaranteed by the department: Technological Systems

Garantor of the study branch: doc. Ing. Pavel Mach, CSc.

Program of study: Electrical Engineering, Power Engineering and Management

Type of study: Follow-up master full-time

Required credits: 111

Elective courses credits: 9

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: 97

The role of the block: P

Code of the group: MEEMBME

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
A1M13BP3	Safety in Electrical Engineering 3	Z	0	2+2j	Z,L	P

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

A1M13BP3	Safety in Electrical Engineering 3	Z	0	The course introduces students to the risks and causes of electric shock, with the safety regulations for handling and working on electrical equipment, protection against electric shock, to practice safer behaviors when working with high voltage and first aid for electric shock. Students will gain the necessary qualifications for the electrical activity of the CTU (c.1/2007 Dean of Instruction).		
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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
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	Z	25	36s	L	P
A0M31DIP	Diploma Thesis	Z	25		L	P
A0M32DIP	Diploma project	Z	25	0P + 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	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

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: MEEMP1

Name of the group: Compulsory subjects of the programm

Requirement credits in the group: In this group you have to gain 61 credits

Requirement courses in the group: In this group you have to complete at least 11 courses

Credits in the group: 61

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
A1M13EMP	Ecology of materials and processes	Z,ZK	5	2P+2L	L	P
A0M16EKE	Economy of Power Industry	KZ	4	2+2s	Z,L	P
A1M15ENY	Power Plants	Z,ZK	5	2+2c	Z	P
A1M14PO2	Electric Drives and Traction 2	Z,ZK	5	2+2L	L	P
A1M14SP2	Electric Machinery and Apparatus 2	Z,ZK	5	2+2L	Z	P
A1M13EZF	Electrochemical Sources and Photovoltaics	Z,ZK	5	2P+2L	Z	P
A1M15PRE	Transmission and Distribution of Electricity	Z,ZK	5	2+2s	L	P
A1M14SSE	Machinery structures of power plants	Z,ZK	4	2+2s	Z	P
A1M15TVN	High Voltage Engineering	Z,ZK	5	2+2L	L	P
A1M14VE2	Power Electronics 2	Z,ZK	5	2+2L	Z	P

Characteristics of the courses of this group of Study Plan: Code=MEEMP1 Name=Compulsory subjects of the programm

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.			
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.			
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			
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.			
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.			
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.			
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.			
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			

Code of the group: MEEMPRO1

Name of the group: Project

Requirement credits in the group: In this group you have to gain 11 credits

Requirement courses in the group: In this group you have to complete at least 2 courses

Credits in the group: 11

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
A1M13IND	Individual Project	Z	6	4L	Z	P
A1M13TP1	Team Project	Z	5	2P+2S	L	P

Characteristics of the courses of this group of Study Plan: Code=MEEMPRO1 Name=Project

A1M13IND	Individual Project	Z	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.			
A1M13TP1	Team Project	Z	5
Teamwork in the form of a project. A team will choose a topic from a range of topics related to its branch of study, which will be specified by branch 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: 10

The role of the block: PO

Code of the group: MEEMPO1

Name of the group: Compulsory subjects of the branch

Requirement credits in the group: In this group you have to gain 10 credits

Requirement courses in the group: In this group you have to complete at least 2 courses

Credits in the group: 10

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
A1M13SVS	Simulation of Production Sytems	Z,ZK	5	2P+2C	Z	PO
A1M13TPR	Technological Project Planning	Z,ZK	5	2P+2S	L	PO

Characteristics of the courses of this group of Study Plan: Code=MEEMPO1 Name=Compulsory subjects of the branch

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.		

Name of the block: Elective courses

Minimal number of credits of the block: 4

The role of the block: V

Code of the group: MEEMH

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	ZK	2	2+0s	Z,L	v
A0M16FI2	Philosophy II	Z,ZK	4	2+2s	L	v
A0B16HTE	History of technology and economic	ZK	2	2+0s	Z,L	v
A0M16HT2	History of science and technology 2	Z,ZK	4	2+2s	L	v
A0M16MPS	Psychology	Z,ZK	4	2+2s	Z,L	v
A0B16MPL	Management psychology	ZK	2	2+0s	Z,L	v
A003TV	Physical Education	Z	2	0+2	L,Z	v
A0M16TE1	Theology	Z,ZK	4	2+2s	L	v

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

A0B16FIL	Philosophy	ZK	2			
A0M16FI2	Philosophy II	Z,ZK	4	The course is oriented on the transdisciplinary aspects of philosophy, informatics, physics, mathematics and biology.		
A0B16HTE	History of technology and economic	ZK	2			
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		
A0M16MPS	Psychology	Z,ZK	4			
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.		
A003TV	Physical Education	Z	2			

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.

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
A0B04GA	<i>Petra Jennings Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04KA	English Conversation 2 <i>Petra Jennings Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04OA	Technical English Course <i>Petra Jennings Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
AE0B04C0	Czech Language 0 <i>Markéta Havlíková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04CIN	<i>Markéta Havlíková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04KF1	French conversation 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04KF2	French conversation 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04F1	French language 1 <i>Markéta Havlíková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04F2	French language 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04F3	French Language 3 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04JAP	Japanese <i>Markéta Havlíková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04GN	German Grammar <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04KN	German Conversation <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04KN2	German conversation 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04N1	German language 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04N2	German language 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04N3	German language 3 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04ON	Professional German <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04CAE1	Certificate of Advanced English CAE 1 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04CAE2	Certificate of Advanced English CAE 2 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04CAE3	Certificate of Advanced English CAE 3 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04CAE4	Certificate of Advanced English 4 <i>Pavla Péterová</i>	Z		2C	Z,L	v
A0B04FCE1	FCE 1 <i>Petra Jennings Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04FCE2	FCE 2 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04FCE4	FCE4 <i>Pavla Péterová</i>	Z	2	2C	Z,L	v
A0B04FCE3	FCE 3 <i>Pavla Péterová</i>	Z	2	2C	Z,L	v
A0B04PZP	Preparation for stay in Germany <i>Dana Lisá Dana Saláková Dana Lisá (Gar.)</i>	Z	2	2C	*	v
A0B04RET	Rhetoric <i>Jitka Pinková Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v
A0B04KR	Russian conversation <i>Jitka Pinková Dana Saláková (Gar.)</i>	Z	2	2C	Z,L	v

A0B04KR2	Russian conversation 2 <i>Jitka Pinková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04R1	Russian language 1 <i>Jitka Pinková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04R2	Russian language 2 <i>Jitka Pinková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04R3	Russian language 3 <i>Jitka Pinková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04R4	Russian language 3 <i>Jitka Pinková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04KS1	Spanish conversation 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04KS2	Spanish conversation 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04S1	Spanish language 1 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04S2	Spanish language 2 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04S3	Spanish language 3 <i>Dana Saláková</i>	Z	2	2C	*	v
A0B04S4	Spanish Language 4 <i>Dana Saláková Dana Saláková (Gar.)</i>	Z	2	2C	*	v
A0B04CA	Technical English for Pre-Intermediate <i>Markéta Havlíková</i>	Z	2	2C	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: Physical education

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) <i>Tutors, authors and guarantors (gar.)</i>	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
TVKZV	Physical Education Course	Z	0	7dní	Z	v
TVKLV	Physical Education Course	Z	0	7dní	L	v

Characteristics of the courses of this group of Study Plan: Code=MTV Name=Physical education

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

Code of the group: MEEMVOLPRE

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
A0M14AML	Aerodynamics and Mechanics of Flight	Z,ZK	4	2+2s	Z	v
A0M31ASN	Algorithms and Structures of Neurocomputers <i>Jana Tu ková Jana Tu ková Jana Tu ková (Gar.)</i>	Z,ZK	5	2P+2C	Z	v
A4M39APG	Algorithms of Computer Graphics	Z,ZK	6	2P+2C	Z	v
A2M17AEK	Antennas and EMC in Radiowave Communication	Z,ZK	5	2+2L	L	v
A4M38AVS	Embedded Systems Application	Z,ZK	6	2P+2L	L	v
A0M31ACS	Architectures of Digital Systems	Z,ZK	4	2P+2C	L	v
A4M36AOS	Service Oriented Architectures	Z,ZK	6	2P+2C	Z	v
A4M33AU	Automatic Reasoning	Z,ZK	6	2P+2C	L	v
A5M17BUP	Biological Effects of Electromagnetic Field <i>Jan Vrba, Ladislav Oppl Jan Vrba Jan Vrba (Gar.)</i>	KZ	4	2P+2L	L	v
A4M33BIA	Bio Inspired Algorithms	Z,ZK	6	2P+2C	L	v
A2M17CAD	CAD and Microwave Circuits	Z,ZK	6	2+2c	Z	v
A0M37CIR	Implementation of the digital circuits in Radio <i>Petr Skalický Petr Skalický Petr Skalický (Gar.)</i>	Z,ZK	5	2P+2L	L	v
A2M99CZS	Digital Signal processing	Z,ZK	5	2P+2C	Z	v
A4M39DPG	Data Structures for Computer Graphics	Z,ZK	6	2P+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
A2M37DKM	Digital communications <i>Jan Sýkora</i>	Z,ZK	4	3+1s	Z	v
A4M33DZO	Digital image	Z,ZK	6	2P+2C	Z	v
A0M37DUP	Satellite navigation systems	Z,ZK	4	2+2L	Z	v
A0M14DMP	Dynamics of mechanical parts of drives	Z,ZK	4	2+2s	Z	v
A1M16EKM	Ekonometrie	Z,ZK	5	2+2c	L	v
A0M15EZS	Electrical Sources and Systems	Z,ZK	5	2+2s	Z	v
A0M31EOF	Electronic Circuits and Filters	Z,ZK	5	2P+2C	L	v
A0M34EZS	Electronic Security Systems <i>Jan Novák, Miroslav Husák, Tomáš Teplý Miroslav Husák (Gar.)</i>	Z,ZK	5	2P+2L	Z	v
A0M33EOA	Evolutionary Optimization Algorithms <i>Petr Pošík Petr Pošík Petr Pošík (Gar.)</i>	Z,ZK	6	2P+2C	Z	v
A2M31IAS	Implementation of Analog Systems	Z,ZK	6	2P+2C	Z	v
A4M34ISC	Systems on Chip	Z,ZK	6	2P+2C	L	v
A3M33IRO	Intelligent robotics	Z,ZK	7	3P+2L	L	v
A2M37KDK	Coding in digital communications <i>Jan Sýkora</i>	Z,ZK	5	3+1c	L	v
A4M35KO	Combinatorial Optimization	Z,ZK	6	3P+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	2P+2L	Z	v
A0M38MAP	Magnetic Elements and Magnetic Measurements	Z,ZK	5	2+2L	Z	v
A0M16MGM	Management <i>Jaroslav Knápek, Milana Hrubá Jaroslav Knápek (Gar.)</i>	Z,ZK	5	2P+2S	Z,L	v
A1M16MAM	Decision Modelling	Z,ZK	5	2+2s	L	v
A1M16MAS	Marketing Strategies	Z,ZK	5	1+3s	Z	v
A0X36MOOC	Massive Open Online Course	Z	2	1P	Z,L	v
A3M01MKI	Mathematics for Cybernetics <i>Jan Hamhalter, Veronika Sobotíková, Martin Bohata Veronika Sobotíková Jan Hamhalter (Gar.)</i>	Z,ZK	8	4P+2S	Z	v
A4M33MPV	Computer Vision Methods	Z,ZK	6	2P+2C	L	v
A0M38MET	Metrology	Z,ZK	5	2+2L	Z	v
A2M99MAM	Microprocessors and microcomputers	Z,ZK	6	2P+2L	L	v

A2M34MST	Microsystems <i>Miroslav Husák</i>	Z,ZK	5	2P+2L	L	v
A2M34MIM	Microsystems in Multimedia <i>Miroslav Husák</i>	Z,ZK	5	2P+2C	L	v
A2M17MOS	Microwave Circuits and Subsystems	Z,ZK	5	2+2c	L	v
A3M33MKR	Mobile and Collective Robotics	Z,ZK	6	2P+2L	Z	v
A2M32MKS	Mobile Communication Networks	Z,ZK	4	2P + 2L	Z	v
A2M32MDS	Modeling and Dimensioning of Networks	Z,ZK	6	3P + 1L	Z	v
A0M14MDS	Simulation of dynamic systems	Z,ZK	4	2+2c	L	v
A0M13MKV	Advanced Components of Power Electronic	Z,ZK	5	2P+2L	L	v
A0M37MOT	Advanced areas in image and video technology	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	2P+2C	Z	v
A4M39MMA	Multimedia and Computer Animation	Z,ZK	6	2P+2L	Z	v
A2M34NAN	Nanoelectronics and Nanotechnology	Z,ZK	5	2P+2C	L	v
A0M17NKA	Antenna Design and Technology	Z,ZK	5	2+2L	Z	v
A4M33NMS	Design and Modeling of Software Systems	Z,ZK	6	2P+2C	Z	v
A0M34NFO	Design of Photonic Circuits <i>Vít zslav Je ábek, Zden k Burian, Václav Prajzler Vít zslav Je ábek</i> <i>Vít zslav Je ábek (Gar.)</i>	Z,ZK	4	2P+2L	L	v
A2M34NIS	Integrated Systems Design	Z,ZK	5	2P+2C	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	2P+2S	Z	v
A2M37OBT	Image Technology	Z,ZK	6	2+2c	Z	v
A0M38OSE	Image Sensors	Z,ZK	5	2P+2L	Z	v
A0M33OSW	Ontologies and Semantic Web	KZ	4	2P+2C	Z	v
AE0M33OSW	Ontologies and Semantic Web	KZ	4	2P+2C	Z	v
A4M35OSP	Open-source programming	Z,ZK	6	2P+2C	L	v
A2M32OSS	Optical Systems and Networks	Z,ZK	5	2P + 2L	L	v
A4M36PAH	Planning and game playing	Z,ZK	6	2P+2C	L	v
A2M17PMP	Computer Aided Modeling of Field	Z,ZK	5	2+2c	L	v
A3M33PRO	Advanced robotics	Z,ZK	6	2P+2L	Z	v
A4M36PAP	Advanced Computer Architectures	Z,ZK	6	2P+2C	Z	v
A4M33RZN	Advanced Methods for Knowledge Representation	Z,ZK	6	2P+2C	Z	v
A2M17PDS	Terrestrial and Satellite Radio Links	Z,ZK	6	2+2c	Z	v
A3M99PTO	Team Work	KZ	6	1P+3C	L	v
A2M01PMS	Probability and Statistics	Z,ZK	8	4+2	Z	v
A1M16PPP	Business Law II	Z	4	3+1s	L	v
A3M35PSR	Real-Time Systems Programming	Z,ZK	6	2P+2C	Z	v
A0M32PRD	Data Communication Means <i>Tomáš Zeman Tomáš Zeman (Gar.)</i>	Z,ZK	5	2P + 2L	Z	v
A0M13PRE	Industrial electronics	Z,ZK	5	2P+2L	Z	v
A0M35PII	Industrial Informatics and Internet	Z,ZK	6	2P+2C	Z	v
A0M33PIS	Industrial Information Systems	Z,ZK	6	2P+2C	L	v
A2M37RSY	Radio systems	Z,ZK	6	2+2L	Z	v
A2M31RAT	Speech technology in telecommunications	Z,ZK	6	2P+2C	L	v
A3M35RIS	Control Systems	Z,ZK	6	2P+2L	Z	v
A2M32RKP	Communication Processes Control	Z,ZK	5	2P + 2L	L	v
A3M38SPD	Data Acquisition and Transfer	Z,ZK	6	2P+2L	Z	v
A2M31SMU	Signals in multimedia	Z,ZK	5	2P+2C	L	v
A0M15SZS	Reliability and Security of Power Systems	Z,ZK	5	2+2s	L	v
A4M33SAD	Machine Learning and Data Analysis	Z,ZK	6	2P+2C	Z	v

A2M34SIS	Integrated System Structures	Z,ZK	5	2P+2C	Z	v
A0M37SEK	Synchronization and equalization in digital communications <i>Jan Sýkora Jan Sýkora Jan Sýkora (Gar.)</i>	Z,ZK	4	3P+1S	Z	v
A0M13TKS	Technology of Cables and Optical waveguides	Z,ZK	5	2P+2L	L	v
A4M33TZ	Theoretical foundations of computer vision, graphics, and interaction	Z,ZK	6	2P+2C	L	v
A4M01TAL	Theory of Algorithms <i>Jan Hamhalter</i>	Z,ZK	6	3P+1S	L	v
A4M33TVS	Software Verification and Testing	Z,ZK	6	2P+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	2P+2C	L	v
A3M38VBM	Videometry and Contactless Measurement	Z,ZK	6	2P+2L	L	v
A3M38VIP	Virtual Instruments	Z,ZK	6	2P+2C	Z	v
A4M39VIZ	Visualization	Z,ZK	6	2P+2C	L	v
A4M39VG	Computational Geometry	Z,ZK	6	2P+2S	Z	v
A2M32VAD	Design of Applications and DSP	Z,ZK	5	2P + 2L	Z	v
A0M31ZLE	Basics of Medical Electronics <i>Jan Havlík Jan Havlík Jan Havlík (Gar.)</i>	Z,ZK	4	2P+2L	L	v
A3M38ZDS	Analog Signal Processing and Digitalization	Z,ZK	6	2P+2L	Z	v
A2M31ZRE	Speech processing	Z,ZK	6	2P+2C	Z	v
A2M37ZVT	Audio Technology	Z,ZK	5	2+2L	L	v
A0M37ZV2	Audio Technology 2	Z,ZK	4	2+2L	Z	v
A4M33TDV	3D Computer Vision	Z,ZK	6	2P+2C	Z	v

Characteristics of the courses of this group of Study Plan: Code=MEEMVOLPRE 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
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
A2M17AEK	Antennas and EMC in Radiowave Communication 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.	Z,ZK	5
A4M38AVS	Embedded Systems Application 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.	Z,ZK	6
A0M31ACS	Architectures of Digital Systems 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	Z,ZK	4
A4M36AOS	Service Oriented Architectures 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.	Z,ZK	6
A4M33AU	Automatic Reasoning 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.	Z,ZK	6
A5M17BUP	Biological Effects of Electromagnetic Field 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.	KZ	4

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.			
A2M17CAD	CAD and Microwave Circuits	Z,ZK	6
This course provides its students with principles and techniques used in modern microwave circuits as well as with basic design methods used in such systems. Basic overview of elements and detailed information on selected circuit design is provided. Students gain design experience during exercises.			
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.			
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.			
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			
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.			
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.			
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 .			
A1M16EKM	Ekonometrie	Z,ZK	5
History of Econometrics, econometric models, input-output models, modelling of demand, time series models, production functions, linear regression models, simultaneous equations models, econometric analysis of economic situation			
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.			
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.			
A0M33EOA	Evolutionary Optimization Algorithms	Z,ZK	6
Evolutionary algorithms are stochastic optimization techniques based on analogies with natural evolution. The goal of this course is to introduce this class of algorithms, their features, issues that may arise when applying them, and present methods how to solve them. Individual algorithms will be introduced during the lectures, including their application areas. During computer labs, students will implement an evolutionary algorithm to solve a non-trivial optimization problem.			
A2M31IAS	Implementation of Analog Systems	Z,ZK	6
The aim of this subject is to present new ways and principles of analog circuit design, especially with respect to the analog signal conditioning for digital processing and transmission systems. A special attention is devoted to design procedures and their implementation in application-specific integrated circuits (ASICs). The subject deals with analog and sampled-data functional blocks, including their modeling and simulation. Specifically, circuits for the design of amplifiers, filters, and data converters are focused as the main point of interest. Concurrent design trends are discussed, introducing the testing issues of analog and mixed-signal ASICs. Electronic system design essentials are presented, taking into account up-to-date technology aspects demonstrated in professional software for modern ASIC design.			
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.			
A2M37KDK	Coding in digital communications	Z,ZK	5
The course extends and deepens the topics of the basic DKM course in the following main areas. 1) The information theory builds a fundamental framework for thorough understanding the principles of the channel coding, adaptation, sharing, and diversity/multiplexing of the MIMO systems. 2) We develop advanced coding technique, particularly turbo-codes, LDPC codes and space-time codes for MIMO. 3) We explain essential principles of iterative decoding methods for turbo and LDPC codes.			
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.			
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.			
A0M16MGM	Management	Z,ZK	5
The methods and procedures of effective management for company leading in competitors area.			
A1M16MAM	Decision Modelling	Z,ZK	5
Other methods of Operations Research and System Analysis: Queueing models, Inventory models, Models of optimal location, Advanced graph models, Markovian processes, Renewal theory, Simulation languages, Practical use of simulation models.			
A1M16MAS	Marketing Strategies	Z,ZK	5
Broadening of basic knowledge of marketing. The analysis of marketing strategies in different market situations. The firm`s behaviour under competition and competitive advantage. Case studies in the field of product policy, price and condition policy, communication policy and distribution policy.			
A0X36MOOC	Massive Open Online Course	Z	2
See https://cw.fel.cvut.cz/b172/courses/a0x36mooc/start for additional details.			
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.			
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.			
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.			
A2M34MST	Microsystems	Z,ZK	5
The course deals with system integration applied in the design of digital and analog systems. It demonstrates the new possibilities of implementation and application of integrated microelectronic devices based on various physical and biochemical principles. It presents primarily MEMS technology that increases reliability with all its attributes. The course presents the modern action elements and microactuators, whose operation is based on fundamental physical and biochemical principles, including basic applications in micromanipulation, microrobots, microdrives, microsurgery, multimedia, medical, industrial control, automotive, etc. In the course are presented the principles of touch screens, microgenerators of electrical energy. There are mentioned basic elements of the use of nanotechnology and nanoelectronic structures and basic microsystem technologies.			
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.			
A2M17MOS	Microwave Circuits and Subsystems	Z,ZK	5
The subject provides wide theoretical and practical knowledge both for scientific-research work and carrier profession in the field of rf. and microwave region. It makes students familiar with rf. and microwave passive and active circuits realized in planar and monolithic structures - lines, directional couplers, power dividers, resonant circuits, filters and CAD tools for design of rf. and microwave circuits. It also contains basis of microwave transistors, bipolar, MESFET and HEMPT, design of low noise, power, narrow band and wideband amplifiers, diode and transistor oscillators, detectors, mixer and frequency multipliers			

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 tools 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.			
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.			
A2M32MDS	Modeling and Dimensioning of Networks	Z,ZK	6
The aim of the course is to present an overlook of dimensioning of telecommunications networks on the basis of results of the queuing theory (QT). Introduce possibilities of simulation and modeling networks both from the point of view of grade of service GoS and quality of service QoS as well. Results of the QT are applied on different service systems and telecommunication networks deploying and operating at time being. Theoretical knowledge about models of service systems can be utilized for dimensioning of different service systems in real life - not only on the telecommunications one.			
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 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.			
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).			
A2M34NAN	Nanoelectronics and Nanotechnology	Z,ZK	5
The subject is oriented on the present nanotechnologies in the connection with their electronic, photonic and spintronic applications. Quantum theory basics are used to explain the effects observed in nanostructures. Basic nanoelectronic structures are described with their possible applications. Modern computer methods and models, which are able to simulate the operation of nanoelectronic structures and which are the important tools for their design and optimisation, are studied.			
A0M17NKA	Antenna Design and Technology	Z,ZK	5
Basics of practical design of antennas for specific frequency bands, modeling, design and construction of antennas. 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.			
A2M34NIS	Integrated Systems Design	Z,ZK	5
Main tasks of integrated circuits designer; design abstraction levels - Y chart. Definitions of specification, feasibility study, criteria for technology and design kits selection. Integrated systems design and simulation methodologies. Main features of full custom design, gate array, standard cells, programmable array logic. Design aspects of RF and mobile low power systems. Verilog-A, Verilog-AMS, VHDL-A. Logic and physical synthesis. Front End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenches design and verification.			
A0M14KOP	Electric Drive Component Design	Z,ZK	5
Theoretical principles and pragmatic procedures in main types electric drives for transport, automation and manipulating technics design. Selection, dimensioning and realisation of drives components: power supply, switching devices, protection, semiconductor converter, electric motor. Project, verification of dimensioning and testing of drive components, realisation of selected part on model drive, experimental parameters examination. Semestrial project optionally fixed on theoretical 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).			

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.).			
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.			
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
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A4M35OSP	Open-source programming	Z,ZK	6
The subject provides insight into world of open-source projects and techniques proved to be useful 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.			
A2M32OSS	Optical Systems and Networks	Z,ZK	5
The course deals with the use of optical radiation for the transmission of information. The aim is to acquaint students with the functions of important components used in an advanced optical communication systems and networks. Students will learn how to design practical optical fiber link and the network. Students will receive theoretical knowledge for the implementation of a all-optical photonic networks in the future, which will be based on a combination of wavelength multiplex with an all-optical switching.			
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).			
A2M17PMP	Computer Aided Modeling of Field	Z,ZK	5
The subject prepares students for independent work with professional software tools for design of elements of radio communication systems on the base of state of art. Knowledge of numerical methods and methods of optimization are parts of the education. The subject also gives the knowledge of the maths for RF radio communication systems and introduces some modern parts on maths together with design of radio communications subsystems.			
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.			
A2M17PDS	Terrestrial and Satellite Radio Links	Z,ZK	6
The goal of the course is to teach the student to design basic types of wireless links from the antennas and propagation point of view, including interference analyses for both fixed links and radio networks and frequency coordination. The design principles are primarily based on international ITU-R recommendations. In addition, the attention is given to prospective wireless systems as well, e.g., intelligent antenna systems.			
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.			
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.			
A1M16PPP	Business Law II	Z	4
Introduction to constitutional system in the Czech Republic. Introduction to general EU structure, legal system of European Union. Administrative Law and administrative procedure. Administrative justice and execution of the administrative decisions. Introduction to building regulation - basic concepts, rights and duties of the parts, material and local competency of administrative bodies, public control. Introduction to copyright law - basic concepts, copyright obligation relationships, physical and legal entities, public control. Introduction to Criminal Law - basic Concepts, rights and duties legal remedies, public control. International Law protection in criminal law matters, the territorial principle in European Union, execution of the decisions, extradition.			
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.			
A0M32PRD	Data Communication Means	Z,ZK	5
A0M13PRE	Industrial electronics	Z,ZK	5
Electronic components, resistors, capacitors, HF coils, transformers Semiconductor devices Mounting technologies Sensors, 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.			
A2M37RSY	Radio systems	Z,ZK	6
Radio systems and their parameters, radar and position determination systems especially. Principles, properties, parameters and applications.			
A2M31RAT	Speech technology in telecommunications	Z,ZK	6
The subject is devoted to basis of speech processing addressed to students of master program with special focus on communication applications as speech technology has currently many applications in communication systems. Further information can be found at http://noel.feld.cvut.cz/vyu/a2m31rat . Detailed information for registered students can be found at teaching portal http://moodle.kme.feld.cvut.cz .			
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.			
A2M32RKP	Communication Processes Control	Z,ZK	5
Subject Telecommunication Processes Control presents review of solution principles for switching systems. It contains solutions for switching fields, control systems and review of signalisations for switching control (in central office as well in networks). Deals mainly with digital switching systems with circuit commutation as well as transport of IP packets. Also contains basic consideration about convergence of voice and data services and networks including functional principles of new generation networks with respect to philosophy and services of intelligence network.			
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.			
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.			
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.			
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.			
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.			
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.			
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			
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.			
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.			
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.			
A2M32VAD	Design of Applications and DSP	Z,ZK	5
The subject makes familiar with selected parts of the digital signal processing in communication. The digital image processing is emphasized.			
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 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.			
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.			
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.			
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
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	
A0B04CIN		Z	2

A0B04F1	French language 1	Z	2
A0B04F2	French language 2	Z	2
A0B04F3	French Language 3	Z	2
A0B04FCE1	FCE 1 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.	Z	2
A0B04FCE2	FCE 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.	Z	2
A0B04FCE3	FCE 3 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.	Z	2
A0B04FCE4	FCE4 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.	Z	2
A0B04GA	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.	Z	2
A0B04GN	German Grammar	Z	2
A0B04JAP	Japanese	Z	2
A0B04KA	English Conversation 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.	Z	2
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 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.	Z	2
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 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.	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
A0B16FIL	Philosophy	ZK	2
A0B16HTE	History of technology and economic	ZK	2
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
A0M13DIP	Diploma Thesis 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.	Z	25

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 Sensors, 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 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			
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 transport, automation and manipulating techniques design. Selection, dimensioning and realisation of drives components: power supply, switching devices, protection, semiconductor converter, electric motor. Project, verification of dimensioning and testing of drive components, realisation of selected part on model drive, experimental parameters examination. Semester project optionally fixed on theoretical 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, 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			
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 antennas. 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, 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			
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 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.			
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.			
A0M32PRD	Data Communication Means	Z,ZK	5
A0M33DIP	Diploma Thesis	Z	25
A0M33EOA	Evolutionary Optimization Algorithms	Z,ZK	6
Evolutionary algorithms are stochastic optimization techniques based on analogies with natural evolution. The goal of this course is to introduce this class of algorithms, their features, issues that may arise when applying them, and present methods how to solve them. Individual algorithms will be introduced during the lectures, including their application areas. During computer labs, students will implement an evolutionary algorithm to solve a non-trivial optimization problem.			
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 requiremets, with focus to stability, planing, 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.			
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.			
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 programes.			
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.			
A1M13BP3	Safety in Electrical Engineering 3	Z	0
The course introduces students to the risks and causes of electric shock, with the safety regulations for handling and working on electrical equipment, protection against electric shock, to practice safer behaviors when working with high voltage and first aid for electric shock. Students will gain the necessary qualifications for the electrical activity of the CTU (c.1/2007 Dean of Instruction).			
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.			
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.			
A1M13IND	Individual Project	Z	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.			
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.			
A1M13TP1	Team Project	Z	5
Teamwork in the form of a project. A team will choose a topic from a range of topics related to its branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.			
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.			
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			
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.			
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.			
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.			
A1M16EKM	Ekonometrie	Z,ZK	5
History of Econometrics, econometric models, input-output models, modelling of demand, time series models, production functions, linear regression models, simultaneous equations models, econometric analysis of economic situation			
A1M16MAM	Decision Modelling	Z,ZK	5
Other methods of Operations Research and System Analysis: Queueing models, Inventory models, Models of optimal location, Advanced graph models, Markovian processes, Renewal theory, Simulation languages, Practical use of simulation models.			
A1M16MAS	Marketing Strategies	Z,ZK	5
Broadening of basic knowledge of marketing. The analysis of marketing strategies in different market situations. The firm's behaviour under competition and competitive advantage. Case studies in the field of product policy, price and condition policy, communication policy and distribution policy.			
A1M16PPP	Business Law II	Z	4
Introduction to constitutional system in the Czech Republic. Introduction to general Eu structure, legal system of European Union. Administrative Law and administrative procedure. Administrative justice and execution of the administrative decisions. Introduction to building regulation - basic concepts, rights and duties of the parts, material and local competency of administrative bodies, public control. Introduction to copyright law - basic concepts, copyright obligation relationships, physical and legal entities, public control. Introduction to Criminal Law - basic Concepts, rights and duties legal remedies, public control. International Law protection in criminal law matters, the territorial principle in European Union, execution of the decisions, extradition.			
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.			
A2M17CAD	CAD and Microwave Circuits	Z,ZK	6
This course provides its students with principles and techniques used in modern microwave circuits as well as with basic design methods used in such systems. Basic overview of elements and detailed information on selected circuit design is provided. Students gain design experience during exercises.			
A2M17MOS	Microwave Circuits and Subsystems	Z,ZK	5
The subject provides wide theoretical and practical knowledge both for scientific-research work and carrier profession in the field of rf. and microwave region. It makes students familiar with rf. and microwave passive and active circuits realized in planar and monolithic structures - lines, directional couplers, power dividers, resonant circuits, filters and CAD tools for design of rf. and microwave circuits. It also contains basis of microwave transistors, bipolar, MESFET and HEMPT, design of low noise, power, narrow band and wideband amplifiers, diode and transistor oscillators, detectors, mixer and frequency multipliers			
A2M17PDS	Terrestrial and Satellite Radio Links	Z,ZK	6
The goal of the course is to teach the student to design basic types of wireless links from the antennas and propagation point of view, including interference analyses for both fixed links and radio networks and frequency coordination. The design principles are primarily based on international ITU-R recommendations. In addition, the attention is given to prospective wireless systems as well, e.g., intelligent antenna systems.			
A2M17PMP	Computer Aided Modeling of Field	Z,ZK	5
The subject prepares students for independent work with professional software tools for design of elements of radio communication systems on the base of state of art. Knowledge of numerical methods and methods of optimization are parts of the education. The subject also gives the knowledge of the maths for RF radio communication systems and introduces some modern parts on maths together with design of radio communications subsystems.			
A2M31IAS	Implementation of Analog Systems	Z,ZK	6
The aim of this subject is to present new ways and principles of analog circuit design, especially with respect to the analog signal conditioning for digital processing and transmission systems. A special attention is devoted to design procedures and their implementation in application-specific integrated circuits (ASICs). The subject deals with analog and sampled-data functional blocks, including their modeling and simulation. Specifically, circuits for the design of amplifiers, filters, and data converters are focused as the main point of interest. Concurrent design trends are discussed, introducing the testing issues of analog and mixed-signal ASICs. Electronic system design essentials are presented, taking into account up-to-date technology aspects demonstrated in professional software for modern ASIC design.			

A2M31RAT	Speech technology in telecommunications	Z,ZK	6
The subject is devoted to basis of speech processing addressed to students of master program with special focus on communication applications as speech technology has currently many applications in communication systems. Further information can be found at http://noel.feld.cvut.cz/vyu/a2m31rat . Detailed information for registered students can be found at teaching portal http://moodle.kme.feld.cvut.cz .			
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 .			
A2M32MDS	Modeling and Dimensioning of Networks	Z,ZK	6
The aim of the course is to present an overlook of dimensioning of telecommunications networks on the basis of results of the queuing theory (QT). Introduce possibilities of simulation and modeling networks both from the point of view of grade of service GoS and quality of service QoS as well. Results of the QT are applied on different service systems and telecommunication networks deploying and operating at time being. Theoretical knowledge about models of service systems can be utilized for dimensioning of different service systems in real life - not only on the telecommunications one.			
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.			
A2M32OSS	Optical Systems and Networks	Z,ZK	5
The course deals with the use of optical radiation for the transmission of information. The aim is to acquaint students with the functions of important components used in an advanced optical communication systems and networks. Students will learn how to design practical optical fiber link and the network. Students will receive theoretical knowledge for the implementation of a all-optical photonic networks in the future, which will be based on a combination of wavelength multiplex with an all-optical switching.			
A2M32RKP	Communication Processes Control	Z,ZK	5
Subject Telecommunication Processes Control presents review of solution principles for switching systems. It contains solutions for switching fields, control systems and review of signalisations for switching control (in central office as well in networks). Deals mainly with digital switching systems with circuit commutation as well as transport of IP packets. Also contains basic consideration about convergence of voice and data services and networks including functional principles of new generation networks with respect to philosophy and services of intelligence network.			
A2M32VAD	Design of Applications and DSP	Z,ZK	5
The subject makes familiar with selected parts of the digital signal processing in communication. The digital image processing is emphasized.			
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 are 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.			
A2M34MST	Microsystems	Z,ZK	5
The course deals with system integration applied in the design of digital and analog systems. It demonstrates the new possibilities of implementation and application of integrated microelectronic devices based on various physical and biochemical principles. It presents primarily MEMS technology that increases reliability with all its attributes. The course presents the modern action elements and microactuators, whose operation is based on fundamental physical and biochemical principles, including basic applications in micromanipulation, microrobots, microdrives, microsurgery, multimedia, medical, industrial control, automotive, etc. In the course are presented the principles of touch screens, microgenerators of electrical energy. There are mentioned basic elements of the use of nanotechnology and nanoelectronic structures and basic microsystem technologies.			
A2M34NAN	Nanoelectronics and Nanotechnology	Z,ZK	5
The subject is oriented on the present nanotechnologies in the connection with their electronic, photonic and spintronic applications. Quantum theory basics are used to explain the effects observed in nanostructures. Basic nanoelectronic structures are described with their possible applications. Modern computer methods and models, which are able to simulate the operation of nanoelectronic structures and which are the important tools for their design and optimisation, are studied.			
A2M34NIS	Integrated Systems Design	Z,ZK	5
Main tasks of integrated circuits designer; design abstraction levels - Y chart. Definitions of specification, feasibility study, criteria for technology and design kits selection. Integrated systems design and simulation methodologies. Main features of full custom design, gate array, standard cells, programmable array logic. Design aspects of RF and mobile low power systems. Verilog-A, Verilog-AMS, VHDL-A. Logic and physical synthesis. Front End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenches design and verification.			
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.			
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.			
A2M37KDK	Coding in digital communications	Z,ZK	5
The course extends and deepens the topics of the basic DKM course in the following main areas. 1) The information theory builds a fundamental framework for thorough understanding the principles of the channel coding, adaptation, sharing, and diversity/multiplexing of the MIMO systems. 2) We develop advanced coding technique, particularly turbo-codes, LDPC codes and space-time codes for MIMO. 3) We explain essential principles of iterative decoding methods for turbo and LDPC codes.			
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.).			
A2M37RSY	Radio systems	Z,ZK	6
Radio systems and their parameters, radar and position determination systems especially. Principles, properties, parameters and applications.			

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.			
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.			
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 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.			
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.			
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 useful 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.			
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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