

Study plan

Name of study plan: Inteligentní budovy

Faculty/Institute/Others: Faculty of Electrical Engineering
 Department:
 Branch of study guaranteed by the department: Welcome page
 Garantor of the study branch:
 Program of study: Intelligent Buildings
 Type of study: Follow-up master full-time
 Required credits: 112
 Elective courses credits: 8
 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: 84
 The role of the block: P

Code of the group: MIBBME
 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
BEZM	Safety in Electrical Engineering for a master's degree Vladimír K la, Radek Havlí ek, Ivana Nová, Josef ernohous, Petr Novák, Zden k Burian, Adam Bou a, Pavel Mlejnek Radek Havlí ek Vladimír K la (Gar.)	Z	0	2BP+2BC	Z	P

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

BEZM	Safety in Electrical Engineering for a master's degree	Z	0			
The course provides for students of all programs periodic training guidelines for health and occupational safety and gives knowledge of electrical hazard of given branch of study. Students receive indispensable qualification according to the current Directive of the Dean.						

Code of the group: MIBDIP
 Name of the group: Diploma Thesis
 Requirement credits in the group: In this group you have to gain at least 26 credits (at most 78)
 Requirement courses in the group: In this group you have to complete at least 1 course
 Credits in the group: 26
 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
A5M99DIP	Diploma Thesis Petr Kašpar	Z	26	0P+20C	L	P
2163086	Thesis Ji í Bašta, Vladimír Šulc Tomáš Matuška Ji í Bašta (Gar.)	Z	26	0P+20C	*	P
125DPIB	Diploma Thesis Hana Kabrhelová Michal Kabrhel (Gar.)	Z	26	20C	L	P

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

A5M99DIP	Diploma Thesis	Z	26			
2163086	Thesis	Z	26			
Thesis is final individual work. This work checks ability of logical independent technical thinking and treatment with technical materials. There is applied acquired knowledge from previous study periods.						

125DPIB	Diploma Thesis	Z	26
The thesis is the final article in which the student demonstrates the ability to independently handle the topic for the building services systems. The student consults his work with the supervisor of the thesis. Themes of work and type of treatment may be different.			

Code of the group: MIBP

Name of the group: Compulsory subjects of the programm

Requirement credits in the group: In this group you have to gain 46 credits

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

Credits in the group: 46

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
125ESB	Buildings Ecology Systems Stanislav Frolík, Hana Kabrhelová, Ilona Koubková Hana Kabrhelová Stanislav Frolík (Gar.)	KZ	4	2P	L	P
125EABI	Energy Audit of Building Hana Kabrhelová	KZ	4	2P	L	P
2161110	Air Conditioning and Industrial Ventilation Miloš Lain	Z,ZK	4	2P+1C	*	P
124KPKP	Building Structures - Final Review Ctislav Fiala Ctislav Fiala Ctislav Fiala (Gar.)	ZK	4	3P	Z	P
124OSIB	Lighting and Acoustics Jaroslav Vychytil, Lenka Maierová Jaroslav Vychytil Jaroslav Vychytil (Gar.)	KZ	4	2P	Z	P
2161108	Transport Phenomena Martin Barták Martin Barták Martin Barták (Gar.)	Z,ZK	4	2P+1C	*	P
2161109	Automatic control in environmental engineering of building Jiří Bašta, Jindřich Bohá Jiří Bašta Jiří Bašta (Gar.)	Z,ZK	4	2P+1C	*	P
A5M14RPI	Distribution of Electric Energy and Drives Jiří Lettl, Pavel Mindl, Jan Bauer Jiří Lettl Jiří Lettl (Gar.)	Z,ZK	5	2P+1L	Z	P
2161102	Radiant and Industrial Heating Jiří Bašta, Jindřich Bohá Jiří Bašta Jiří Bašta (Gar.)	Z,ZK	4	2P+1C	*	P
A5M38SZS	Sensors and Networks Antonín Platil, Pavel Ripka Antonín Platil Pavel Ripka (Gar.)	Z,ZK	4	2P+1L	Z	P
124ST1	Thermal Engineering in Construction 1 Jan Tywoniak Jan Tywoniak (Gar.)	ZK	5	2P	Z	P
2161567	Ventilation and Air Conditioning Vladimír Zmrhal, František Drkal, Miloš Lain Vladimír Zmrhal Vladimír Zmrhal (Gar.)	Z,ZK	4	2P+1C	2	P

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

125ESB	Buildings Ecology Systems Principles of environmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, system design, pumping devices, water saving and special installations.	KZ	4
125EABI	Energy Audit of Building Advanced course for introduction into energy auditing. Lectures topics: Energy audit and energy performance of buildings, legislation. EPDB - energy performance directive for buildings. Methodology of calculating energy performance of buildings. Energy audit - procedure and parts. Sankey energy flow diagram. Analysis of initial condition, description of initial condition object survey and survey of project documentation. Determining source efficiency, distribution and emission of heat. Steps towards reduction of energy consumption - building, heating, lighting, ventilating systems, technologies. Application of measures on a specific object. Synergic impact of energy saving measures. Economical evaluation, evaluation from the aspect of environment protection. Evaluation - emission Individual object survey. Energy audit of industrial objects. Methods of buildings evaluation. Seminar is focused on the realistic buildings resulting to presenting case study report about energy audit of existing building.	KZ	4
2161110	Air Conditioning and Industrial Ventilation Main functional elements of ventilation and air conditioning systems. Air conditioning systems. Ventilation systems for residential and technological rooms.	Z,ZK	4
124KPKP	Building Structures - Final Review	ZK	4
124OSIB	Lighting and Acoustics	KZ	4
2161108	Transport Phenomena Basics of transport phenomena for the study programme Intelligent Buildings. Momentum, heat and mass transport in built environment.	Z,ZK	4
2161109	Automatic control in environmental engineering of building Application of basic approaches to automatic control of HVAC systems and equipments. Automatic control sequences of air conditioning and sources of heat.	Z,ZK	4
A5M14RPI	Distribution of Electric Energy and Drives	Z,ZK	5
2161102	Radiant and Industrial Heating Student will be informed about the basics of radiant and other industrial heating systems	Z,ZK	4
A5M38SZS	Sensors and Networks Applications of sensors in buildings	Z,ZK	4
124ST1	Thermal Engineering in Construction 1	ZK	5
2161567	Ventilation and Air Conditioning Main knowledge for design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of thermal and humidity state and quality of air in residential and technological rooms.	Z,ZK	4

Code of the group: MIBPRO1

Name of the group: Project 1

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

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

Credits in the group: 6

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2163033	Design IB I. <i>Ji í Bašta, Vladimír Zmrhal, Martin Barták, Ji í Hemerka, Miroslav Ku era, Miloš Lain, Roman Vav í ka, Tomáš Matuška, Pavel Vybíral, Ji í Bašta Ji í Bašta (Gar.)</i>	Z	6	0P+4C	*	P
125PIB1	Project 1 <i>Stanislav Frolík, Michal Kabrhel, Hana Kabrhelová, Karel Kabele, Ilona Koubková, Karel Papež, Vladimír Jelínek, Bohumír Garlík, Daniel Adamovský, Hana Kabrhelová Michal Kabrhel (Gar.)</i>	Z	6	4C	L	P
A5M99PR1	Project 1 <i>Pavel Mlejnek Petr Kašpar (Gar.)</i>	Z	6	0P+4C	L	P

Characteristics of the courses of this group of Study Plan: Code=MIBPRO1 Name=Project 1

2163033	Design IB I. Design of heating systems, heat distributors and systems for using recoverable source of energy. Design of ventilation and air conditioning systems, including gas cleaning and reduction of noise.	Z	6
125PIB1	Project 1 The Project 1 is the subject of an inter-faculty field of Intelligent Buildings. Its content is focused on intelligent buildings to connect knowledge from undergraduate studies to other disciplines. Students in the project demonstrates the ability to independently handle project in intelligent buildings using a thorough analysis of current problems from the literature.	Z	6
A5M99PR1	Project 1 The topic of the thesis is chosen by the student and selected from the list of topics. "Project 1" is followed by "Project 2" with a higher difficulty. The assignment of the project is subject to the approval of the faculty guarantor or tutor. The work will be publicly presented.	Z	6

Code of the group: MIBPRO2

Name of the group: Project 2

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

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

Credits in the group: 6

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
2163034	Project IB II. <i>Ji í Bašta Ji í Bašta (Gar.)</i>	Z	6	0P+4C	*	P
125PIB2	Project 2 <i>Hana Kabrhelová Michal Kabrhel (Gar.)</i>	Z	6	4C	Z	P
A5M99PR2	Project 2 <i>Pavel Mlejnek Petr Kašpar (Gar.)</i>	Z	6	0P+4C	Z	P

Characteristics of the courses of this group of Study Plan: Code=MIBPRO2 Name=Project 2

2163034	Project IB II. Project and experimental solution of environmental devices. Optimization investment and operating costs, economic appraisal of ecologic investment.	Z	6
125PIB2	Project 2 The Project 2 is the subject of an inter-faculty field of Intelligent Buildings. Students in the project demonstrates the ability to independently handle project in intelligent buildings.	Z	6
A5M99PR2	Project 2 The topic of the thesis is chosen by the student and selected from the list of topics. Project 2 mostly follows the topic of "Project 1" with a higher difficulty. The assignment of the project is subject to the approval of the faculty guarantor or tutor. The work will be publicly presented.	Z	6

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 24

The role of the block: PV

Code of the group: MIBPV1

Name of the group: Compulsory optionally subjects

Requirement credits in the group: In this group you have to gain at least 8 credits (at most 44)

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

Credits in the group: 8

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
2162035	Alternative Energy Sources Tomáš Matuška Tomáš Matuška Tomáš Matuška (Gar.)	KZ	4	2P+1C	*	PV
A5M15ES1	Electrical Light 1 Petr Žák Petr Žák	KZ	4	2P+1S	Z	PV
125EIBB	Electroengineering and intelligent buildings Stanislav Frolík, Hana Kabrhelová, Karel Kabele, Ilona Koubková, Bohumír Garlík Bohumír Garlík Bohumír Garlík (Gar.)	KZ	4	2P	Z	PV
125ESBB	Building Energy Systems 1 Hana Kabrhelová	ZK	4	2P	Z	PV
124INBB	Integrated Design of Buildings Petr Hájek, Antonín Lupíšek Antonín Lupíšek Petr Hájek (Gar.)	Z,ZK	4	2P+1C		PV
A5M38MEB	Measurements in the Buildings Petr Kašpar Petr Kašpar Petr Kašpar (Gar.)	KZ	4	2P+1L	Z	PV
2152038	Energy Sources and Conversions	KZ	4	3P+1C	*	PV

Characteristics of the courses of this group of Study Plan: Code=MIBPV1 Name=Compulsory optionally subjects

2162035	Alternative Energy Sources Principles and basics of alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization.	KZ	4
A5M15ES1	Electrical Light 1	KZ	4
125EIBB	Electroengineering and intelligent buildings Construction of intelligent buildings (IB) is founded on mathematical-physical principles and draws from various definitions of IB. The information society, intelligent systems, new technologies, and nanotechnologies have significant impact on various system applications of technical equipment of buildings. The underlying idea is mainly energy and material saving and provision of the optimum parameters of indoor and outdoor environment. A new field rises, focused on user oriented building industry. Influence of electromagnetic environment, electromagnetic compatibility, implementation of intelligently operating equipment in buildings requires a systemic approach to solution of the whole complex of technical equipment of buildings. To let the students have a good grasp on new solutions within technical equipment of buildings and construction of IB, this subject aims to present a general view of such solutions. In a transparent form via examples, description of existing and future IB solutions, explanation of logical systems, including logical PLC control and IRC control of building on the room level, communications and implementation of fuzzy control shall be provided. New installation of LonWorks networks inside the building shall be described, same as intelligent ABB i-bus and KNX/EIB wiring, aimed at energy saving. The final part of the lectures shall concentrate on electronic access control and fire alarm security systems within the integrated control system.	KZ	4
125ESBB	Building Energy Systems 1 Analysis and concept of building energy systems, focused on building energy distribution - water and steam heating systems, hot water generation.	ZK	4
124INBB	Integrated Design of Buildings	Z,ZK	4
A5M38MEB	Measurements in the Buildings The students will learn about principles of measurement of basic physical quantities in the building. As the majority of the physical quantities are converted to the electrical signals, an overview of measurement of the electrical quantities is also presented. The subject is not intended for students who have already studied the subjects Electrical measurement and Sensors and transducers on CTU FEE.	KZ	4
2152038	Energy Sources and Conversions	KZ	4

Code of the group: MIBPV3

Name of the group: Compulsory optionally subjects

Requirement credits in the group: In this group you have to gain at least 12 credits (at most 52)

Requirement courses in the group: In this group you have to complete at least 3 courses

Credits in the group: 12

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
2152060	Refrigeration Technique and Heat Pumps for Intelligent Buildings	KZ	4	3P+1C	*	PV
A5M33DSP	Databases, Networks and Programming Techniques	KZ	4	3P+1C	Z	PV
A5M16EUE	Economics of Energy Use Jiří Beranovský Jiří Beranovský Jiří Beranovský (Gar.)	KZ	4	3P+1C	Z	PV
A5M14EPO	Electric Drives Jiří Lettl	KZ	4	3+2L	L	PV
A5M38BEM	Electromagnetic compatibility	KZ	4	1P+1L	Z	PV
A5M34EVS	Electronic security systems Miroslav Husák, Jan Novák Miroslav Husák (Gar.)	KZ	4	3P+1L	Z	PV
2162700	Experimental Methods 1 Miroslav Kuera Miroslav Kuera Miroslav Kuera (Gar.)	KZ	4	0P+4L	*	PV
A5M13FVS	Photovoltaic Systems Jakub Holovský, Ladislava erná, Vít zslava Benda Jakub Holovský Jakub Holovský (Gar.)	KZ	4	3P+1L	Z	PV

A5M13NZZ	Independent sources <i>Karel Dušek, Václav Papež Karel Dušek Karel Dušek (Gar.)</i>	KZ	4	3P+1L	Z	PV
2162064	Noise and Vibration Control <i>Miroslav Ku era, Richard Nový Miroslav Ku era Miroslav Ku era (Gar.)</i>	KZ	4	2P+1C	*	PV
125SYB	Building Systems <i>Stanislav Frolík, Hana Kabrhelová, Karel Kabele, Jan Tywoniak, Roman Musil Hana Kabrhelová Karel Kabele (Gar.)</i>	ZK	4	4P	Z	PV
125TECE	Technological Units <i>Stanislav Frolík, Hana Kabrhelová, Karel Kabele, Ilona Koubková Hana Kabrhelová Ilona Koubková (Gar.)</i>	KZ	4	2P	Z	PV

Characteristics of the courses of this group of Study Plan: Code=MIBPV3 Name=Compulsory optionally subjects

2152060	Refrigeration Technique and Heat Pumps for Intelligent Buildings	KZ	4
A5M33DSP	Databases, Networks and Programming Techniques	KZ	4
A5M16EUE	Economics of Energy Use Organization and energy management of company, buildings or energy systems. Energy need and consumption, energy balance. Energy characterization of aggregate, secondary energy sources. Energy audit and feasibility study, optimization of energy management of energy systems. Prices and tariffs, economy and financial analysis.	KZ	4
A5M14EPO	Electric Drives	KZ	4
A5M38BEM	Electromagnetic compatibility	KZ	4
A5M34EZS	Electronic security systems	KZ	4
2162700	Experimental Methods 1 Introduction study of experimental technique in environmental engineering	KZ	4
A5M13FVS	Photovoltaic Systems Solar energy and its exploitation using photovoltaic systems. Photovoltaic phenomena, solar cells and their characteristics, solar modules (construction, technology, parameters). Photovoltaic systems (including energy conservation). Photovoltaic system applications, optimisation of operating conditions. Basic economical and ecological aspects, present trends.	KZ	4
A5M13NZZ	Independent sources Electrochemical sources of the electric power - overview. Electrochemical sources (accumulators), applications. Uninterruptible power sources in IB. Other sources of the electrical energy. Perspective sources of electrical energy, storage of energy.	KZ	4
2162064	Noise and Vibration Control Student will be informed about the basic acoustic dimensions, which are important for evaluation of noise.	KZ	4
125SYB	Building Systems	ZK	4
125TECE	Technological Units Saunas, fireplaces, kitchen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems.	KZ	4

Code of the group: MIBPV2

Name of the group: Compulsory optionally subjects

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 68)

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
A5M02AKA	Acoustic Applications <i>Ond ej Ji í ek Ond ej Ji í ek Ond ej Ji í ek (Gar.)</i>	KZ	4	2P+2L	L	PV
A5M13AEZ	Application of Electrochemical Sources	KZ	4	3P+1L	L	PV
A5M35DRS	Distributed Control Systems	Z,ZK	4	2P+2C	L	PV
A5M34ELE	Electronics <i>Adam Bou a, Vít Záhlava Adam Bou a Adam Bou a (Gar.)</i>	KZ	4	3P+1L	L	PV
125OZEB	Renewable Energy Sources <i>Stanislav Frolík, Michal Kabrhel, Hana Kabrhelová, Karel Kabele, Ilona Koubková Hana Kabrhelová Michal Kabrhel (Gar.)</i>	ZK	4	2P	L	PV
A5M33UIP	Advanced Artificial Intelligence	KZ	4	3P+1C	L	PV
125PBZB	Fire Services <i>Stanislav Frolík, Hana Kabrhelová, Karel Kabele, Ilona Koubková, Karel Papež, Bohumír Garlík Hana Kabrhelová Ilona Koubková (Gar.)</i>	KZ	4	2P	L	PV
A5M38SPD	Collection and data transfer <i>Pavel Mlejnek Pavel Mlejnek Pavel Mlejnek (Gar.)</i>	KZ	4	3P+1L	L	PV
124ST2	Thermal Engineering 2 <i>Ji í Novák Jan Tywoniak</i>	KZ	4	2P		PV
2162114	Heating <i>Ji í Bašta</i>	KZ	4	2P+1C	*	PV
A5M13VSO	Solar Energy Utilization <i>Vít zslav Benda</i>	KZ	4	1P+1L	L	PV
2162115	Ventilation and Air Conditioning <i>Vladimír Zmrhal</i>	KZ	4	2P+1C	*	PV
A5M14ZSE	Fundamentals of Power Electrical Engineering	KZ	4	2+1L	L	PV

Characteristics of the courses of this group of Study Plan: Code=MIBPV2 Name=Compulsory optionally subjects

A5M02AKA	Acoustic Applications	KZ	4
Lecture summarize applications in physical acoustics, room and building acoustics, environmental acoustics, noise and vibration control, physiological acoustics, diagnostics, and ultrasound.			
A5M13AEZ	Application of Electrochemical Sources	KZ	4
Electrochemical sources of the electric power - overview. Primary cells and accumulators. Methods of accumulator charging. Alternative sources of electrical energy. Uninterruptible power sources and their control. Sources for electrochemical production processes and their control. Environmental aspects of the electrochemical sources and production processes.			
A5M35DRS	Distributed Control Systems	Z,ZK	4
A5M34ELE	Electronics	KZ	4
125OZEB	Renewable Energy Sources	ZK	4
The course deals with renewable energy sources and energy systems in buildings. The various types of energy are discussed in detail - solar, wind, biomass, geothermal and hydro. Described are the characteristics of energy utilization and appropriate ways.			
A5M33UIP	Advanced Artificial Intelligence	KZ	4
The aim of the course is to provide an overview of advanced methods used at development of intelligent systems. The following topics are discussed: advanced methods of state space search, machine learning, data mining, nature inspired algorithms (PSO, ACO, evolutionary algorithms, artificial life), multiagent systems, and their applications.			
125PBZB	Fire Services	KZ	4
Fire water,hydrant systems,fire pipe,fire station.Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment.Protecting buildings against fire spread from technological equipment.Electric fire alarm. Fire control equipment. Backup power source.			
A5M38SPD	Collection and data transfer	KZ	4
124ST2	Thermal Engineering 2	KZ	4
2162114	Heating	KZ	4
Supplemented knowledge from heating of residential and industrial buildings. Designing of convective and radiant heating systems.			
A5M13VSO	Solar Energy Utilization	KZ	4
Solar energy. Photo-thermal phenomena.Photo-thermal power stations. Photovoltaic phenomena. Photovoltaic cells and modules and their characteristics. Photovoltaic systems and their applications. Significance, economic and environmental aspects of solar energy exploitation.			
2162115	Ventilation and Air Conditioning	KZ	4
Main principles of ventilation and air conditioning. Source materials for design of systems. Natural ventilation, forced ventilation, air conditioning systems - output (capacity)and operation.			
A5M14ZSE	Fundamentals of Power Electrical Engineering	KZ	4

Name of the block: Elective courses

Minimal number of credits of the block: 4

The role of the block: V

Code of the group: MIBVOL

Name of the group: Elective subjects

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 45)

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

Credits in the group: 4

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
A4M35OSP	Open-source programming	Z,ZK	6	2P+2C	L	v
A0M35PII	Industrial Informatics and Internet	Z,ZK	6	2P+2C	Z	v
A3M35RIS	Control Systems	Z,ZK	6	2P+2L	Z	v
A3M38VBM	Videometry and Contactless Measurement	Z,ZK	6	2P+2L	L	v

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

A4M35OSP	Open-source programming	Z,ZK	6
The subject provides insight into world of open-source projects and techniques proved to be usefull for larger applications and operating systems development. Reasons leading to the founding of GNU project is discussed and possible andwantages of this approach for cooperation even for commercial subjects is shown. Usual tools used for development, debugging and source code control and functional testing are described. Description of POSIX type operating system structure and introduction to the driver development, user-space libraries and user graphics environments comes next. The last topic is introduction how to use earlier described techniques and support for embedded applications development and real-time control.			
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.			
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.			
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.			

Code of the group: MIBVOLIT

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:

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
A3M14AML	Aerodynamics and mechanics of flight	Z,ZK	6	2+2c	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
A4M36BIS	Information and System Security	Z,ZK	6	2P+2C	Z	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
A1M16CTR	Controlling	Z,ZK	6	2+2s	Z	v
A0M37CIR	Implementation of the digital circuits in Radio <i>Petr Skalický Petr Skalický Petr Skalický (Gar.)</i>	Z,ZK	5	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
A1M16DES	Power Transport Systems	Z,ZK	5	2+2s	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
A1M16EKL	Ecology and economy	Z,ZK	5	3+1s	Z	v
A1M13EMP	Ecology of materials and processes	Z,ZK	5	2P+2L	L	v
A1M16EKM	Ekonomie	Z,ZK	5	2+2c	L	v
A1M16EUE	Economy of Energy Use <i>Jiří Beranovský</i>	Z,ZK	5	2+2s	L	v
A1M15ENY	Power Plants	Z,ZK	5	2+2c	Z	v
A1M14PO2	Electric Drives and Traction 2	Z,ZK	5	2+2L	L	v
A1M14SP2	Electric Machinery and Apparatus 2	Z,ZK	5	2+2L	Z	v
A1M15EST	Electrical Light and Heat	Z,ZK	5	2+2c	Z	v
A0M15EZS	Electrical Sources and Systems	Z,ZK	5	2+2s	Z	v
A1M13EZF	Electrochemical Sources and Photovoltaics	Z,ZK	5	2P+2L	Z	v
A0M31EOF	Electronic Circuits and Filters	Z,ZK	5	2P+2C	L	v
A0M34EZS	Electronic Security Systems <i>Miroslav Husák, Jan Novák, Tomáš Teplý Miroslav Husák (Gar.)</i>	Z,ZK	5	2P+2L	Z	v
A1M14ESZ	Power Machine Equipment	Z,ZK	4	2+2s	Z	v
A0M33EOA	Evolutionary Optimization Algorithms <i>Jiří Kubalík, Petr Pošík Petr Pošík Petr Pošík (Gar.)</i>	Z,ZK	6	2P+2C	Z	v
A1M16FIM	Financial Management	Z,ZK	6	2+2c	L	v
A1M16FIU	Financial Accounting <i>Josef ernohous</i>	Z,ZK	5	2+2s	Z	v
A2M31IAS	Implementation of Analog Systems	Z,ZK	6	2P+2C	Z	v
A4M34ISC	Systems on Chip <i>Jiří Jakovenko</i>	Z,ZK	6	2P+2C	L	v

A3M33IRO	Intelligent robotics	Z,ZK	7	3P+2L	L	v
A2M37KDK	Coding in digital communications <i>Jan Sykora</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 <i>Petr Kašpar</i>	Z,ZK	5	2+2L	Z	v
A1M16MES	Management and Economics of Power Systems	Z,ZK	6	2+2s	Z	v
A1M16MAV	Production Management	Z,ZK	5	2+2s	L	v
A1M16MEE	Management of Power Production	Z,ZK	5	2+2s	L	v
A1M16MAM	Decision Modelling	Z,ZK	5	2+2s	L	v
A1M16MAR	Marketing	Z,ZK	5	2+2s	Z	v
A1M16MAS	Marketing Strategies	Z,ZK	5	1+3s	Z	v
A1M01MPE	Mathematics for Economy	Z,ZK	6	4+2	Z	v
A3M01MKI	Mathematics for Cybernetics	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 <i>Vít zslav Benda</i>	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 <i>Antonín Platil</i>	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
A3M37NAV	Navigation	Z,ZK	6	2+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>Zden k Burian, Vít zslav Je ábek, 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 <i>Ji í Jakovenko</i>	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>Lubor Jirásek, Jan Novák 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
A4M39GPU	General-Purpose Computing on GPU	KZ	4	1P+2C	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
A1M16OVY	Operations Research	Z,ZK	5	2+2c	L	v
A2M32OSS	Optical Systems and Networks	Z,ZK	5	2P + 2L	L	v

A3M38PRS	Airborne Monitoring and Control Systems	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
A1M16LOG	Business Logistics	Z,ZK	5	2+2s	Z	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
A2M01PMS	Probability and Statistics	Z,ZK	8	4+2	Z	v
A1M16PPP	Business Law II	Z	4	3+1s	L	v
A4M39PGR2	Computer Graphics 2	Z,ZK	6	2P+2C	L	v
A3M35PSR	Real-Time Systems Programming	Z,ZK	6	2P+2C	Z	v
A1M16PMG	Project Management	KZ	5	2+2s	L	v
A0M32PRD	Data Communication Means <i>Tomáš Zeman Tomáš Zeman (Gar.)</i>	Z,ZK	5	2P + 2L	Z	v
A0M13PRE	Industrial electronics <i>Václav Papež</i>	Z,ZK	5	2P+2L	Z	v
A1M15PRE	Transmission and Distribution of Electricity	Z,ZK	5	2+2s	L	v
A3M38PSL	Aircraft and Spacecraft Instrumentation	Z,ZK	6	2P+2L	Z	v
A4M39PUR	Psychology in HCI	KZ	4	2P+2S	Z	v
A2M37RSY	Radio systems	Z,ZK	6	2+2L	Z	v
A4M39RSO	Realistic Image Synthesis	Z,ZK	6	2P+2C	L	v
A1M16RES	Development of Energy Systems	Z,ZK	5	2+2s	Z	v
A2M31RAT	Speech technology in telecommunications	Z,ZK	6	2P+2C	L	v
A3M35RIS	Control Systems	Z,ZK	6	2P+2L	Z	v
A1M14RPO	Electric Drive Control	Z,ZK	5	2+2L	L	v
A1M15RES	Control of Power Systems	Z,ZK	5	2+2c	L	v
A1M16JAK	Quality management	Z,ZK	5	2+2s	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
A1M14SOP	Simulation and Optimization in Drives	Z,ZK	5	2+2L	Z	v
A1M13SVS	Simulation of Production Sytems	Z,ZK	5	2P+2C	Z	v
A4M33SEP	A Practical Approach to Software <i>Michal Hlavatý, Bohumír Zoubek, Martin Hlavatý, Jonáš Klimeš Bohumír Zoubek (Gar.)</i>	Z,ZK	6	2P+2C	Z	v
A0M15SZS	Reliability and Security of Power Systems	Z,ZK	5	2+2s	L	v
A1M16STA	Statistical methods in economics	Z,ZK	5	2+2c	L	v
A1M14SSE	Machinery structures of power plants	Z,ZK	4	2+2s	Z	v
A2M34SIS	Integrated System Structures <i>Jan Novák, Vít zslav Je ábek, Ji í Jakovenko, Vladimír Janí ek Ji í Jakovenko Ji í Jakovenko (Gar.)</i>	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
A1M16SIR	System Analysis and Decision Making	Z,ZK	5	2+2c	Z	v
A3M35SRL	Flight Control Systems	Z,ZK	6	2P+2L	Z	v
A1M15TVN	High Voltage Engineering	Z,ZK	5	2+2L	L	v
A1M13TPR	Technological Project Planning	Z,ZK	5	2P+2S	L	v
A0M13TKS	Technology of Cables and Optical waveguides <i>Karel Dušek</i>	Z,ZK	5	2P+2L	L	v
A1M32TSY	Telecommunication Systems	Z,ZK	4	2P + 2L	Z	v
A4M33TZ	Theoretical foundations of computer vision, graphics, and interaction	Z,ZK	6	2P+2C	L	v
A4M01TAL	Theory of Algorithms <i>Marie Demlová, Natalie Žukovec Marie Demlová (Gar.)</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 <i>Antonín Platil</i>	Z,ZK	6	2P+2C	Z	v
A4M39VIZ	Visualization	Z,ZK	6	2P+2C	L	v
A2M01VKM	Selected chapters in mathematics	Z,ZK	8	4+2	Z	v
A1M14VE2	Power Electronics 2	Z,ZK	5	2+2L	Z	v
A4M39VG	Computational Geometry	Z,ZK	6	2P+2S	Z	v
A1M13VES	Manufacturing of Electrical Components <i>Václav Papež</i>	KZ	4	2P+2L	Z	v
A1M16VEN	Power and Heat Production	KZ	5	2+2s	Z	v
A2M32VAD	Design of Applications and DSP	Z,ZK	5	2P + 2L	Z	v
A4M33VIA	Internet Applications Development <i>Jan Šedivý Jan Šedivý Jan Šedivý (Gar.)</i>	Z	3	1P+1C	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=MIBVOLIT Name=Elective subjects

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.		
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.		
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.		
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.		
A3M14AML	Aerodynamics and mechanics of flight	Z,ZK	6	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. There are discussed elements of propeller, jet and rocket propulsion and necessary conditions for airplane stability and control subject. Further subject deals with basic tasks of airplane performance, motion of spacecraft in space and its re-entry to earth surface.		
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 focused to EEG and ECG processing, also to possibilities of applications ANN at physiotherapy,		
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.		
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.		
A4M38AVS	Embedded Systems Application	Z,ZK	6	This course presents applications of embedded systems and their specifics. It is expected that the students have had a programming course, and thus the course is more oriented on explaining and describing the blocks and functions of embedded systems and their use in signal processing, rather than writing code. After completing this course, students should have an overview of usability and power of available processors, and their peripherals, on the basis of which, they should be able to independently design embedded systems for a wide spectrum of applications.		
A0M31ACS	Architectures of Digital Systems	Z,ZK	4	Types of processor architectures, singlechip and multichip computers. Processor structures for real-time digital signal processing. Data flow driven computers. Artificial neural nets. Structures designed in accordance with procedures of data processing, architectural considerations. Design of circuits for digital signal processing and arithmetic operations, design of processors and peripherals, low-power design techniques. Data synchronization and communication between asynchronous clock-domains		

A4M36AOS	Service Oriented Architectures	Z,ZK	6
The lecture focuses on service-oriented computing (SOC) and service-oriented architecture (SOA). Basic concepts of SOC will be explained on the service level (service description, discovery and invocation) and process level (business process formalization, service composition, transaction mechanisms) with respect to SOC utilization for flexible business applications implementation in (semi-)open environment (intra- i inter-enterprise). Besides basic web-services specifications and technologies (SOAP, WSDL, UDDI, BPEL) the up-to-date technologies for semantic web-services will be introduced. Great emphasis will be put on representation and modeling formalisms (RDF, RDFS, OWL). Open environment operation aspects will be also presented (reputation, trust, quality-of-service, privacy). The goal of the course is to bring general overview, but particular SOA platforms and tools (Sun Glassfish, JBoss) will be also introduced including comparison to older distributed systems architectures (CORBA, DCOM) and related domain of multi-agent systems. The design methodology, implementation, and deployment will be explained with relation to existing business processes and organizational structures.			
A4M33AU	Automatic Reasoning	Z,ZK	6
Theorem proving is no more restricted to mathematics, but it is ever more often used in situations, when one needs to make sure that the suggested procedure meets the initial requirements it is used in deductive databases as well as for verification of SW or HW components. The process of proof construction has to be automated for that purpose. The course reviews current systems of 1st order theorem proving and their practical applications. There are explained underlying theoretical principles (model checking, resolution, tableaux) together with their practical and theoretical constraints. Special attention is devoted to gaining experience in choosing the best tool to solve a specific problem, in identification of mistakes in input or in strengthening the obtained results.			
A4M36BIS	Information and System Security	Z,ZK	6
The goal of the course is to give the students a basic grasp of information/system security problems and solutions. Rather than teaching specific current technologies and vulnerabilities/threats, we will introduce general problems, formalize them if appropriate and illustrate them with a wide range of examples, both with current and legacy technologies. We put emphasis on problems that will be encountered by most programmers and developers through their careers.			
A5M17BUP	Biological Effects of Electromagnetic Field	KZ	4
Biophysical Aspects of Electromagnetic Fields (EF) coupling of Various Biological Systems (BS). Interaction of EF with BS - overview. Mechanism of Interaction and Biological Effects. Experimental Results and Hypotheses of Biological Effects of Static and Stationary Electrical, Magnetic and Nonstationary Fields. Mathematical Solution of Interaction. EF generated by living Organism. Applications of EF in Medicine. Hygienic Standards.			
A4M33BIA	Bio Inspired Algorithms	Z,ZK	6
The students will learn some of the unconventional methods of computational intelligence aimed at solving complex tasks of classification, modeling, clustering, search and optimization. Bio-inspired algorithms take advantage of analogies to various phenomena in the nature and society. The main topics of the subject are artificial neural networks and evolutionary algorithms.			
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.			
A1M16CTR	Controlling	Z,ZK	6
Course primary objective is in introducing the Management Control (Controlling) as the up-to-date approach to management of the organization (enterprise, institution). To explain its changing role in management on its development in past decades from functional form, over reporting period, to integral concept of the management control of the organization. Both points of view - the recent theoretical bibliography and context of advanced practice are considered. The course focuses on key linkages among functional areas, key processes and activities in management control system. The course deals with managerial methods and other managerial tools to be applied in management of single entities of management control system and in their interrelated actions.			
A0M37CIR	Implementation of the digital circuits in Radio	Z,ZK	5
The course is base for student, which want practically designed circuits of the digital signal processing with the signal processors and specialised circuits. Attention is concentration to realisation of the modulators and circuit of the numerical conversion of the signal, algorithms coding/decoding, which contains in the communication chain. Dominantly is concentration to effective realization with minimal computing power.			
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.			
A1M16DES	Power Transport Systems	Z,ZK	5
Economical aspects of energy transport. Electricity transportation through lines. Heat, gas and oil lines. There are ment also universal transport systems as railway, roads and ships with considering of energy transport. After technical introduction it is dealt with problems of economical design of transport lines and economical operation			
A0M37DUP	Satellite navigation systems	Z,ZK	4
Existing, future and past radio satellite navigation systems. Course is addressed to students without knowledge of radio engineering. Attention is paid to measurements and practical tasks in laboratory and to experimental receiver programming.			

A0M14DMP	Dynamics of mechanical parts of drives	Z,ZK	4
Subject is oriented to mathematical description and solving of dynamic processes in mechanic parts of machines and drives. Dynamics of rotational and general plane motion, effects of inertial forces on body, balancing of rotors. Vector and analytic methods of composing equations of motion of systems and their solving. Vibration in machine set and vibration effects reducing. Stress and deformation in rotating parts, critical speed of rotors. Drives characteristics and transient events in systems with driving aggregates .			
A1M16EKL	Ecology and economy	Z,ZK	5
Development of environmental protection. Sustainable development. Global environmental problems and their aspects. Greenhouse effect and climate changes. Fossil fuels, nuclear fuel cycle and environmental impacts. Support schemes for renewable energy sources utilization. Economic effectiveness of renewable energy sources projects. Regulatory and economic instruments for economic activities regulation. Externalities. Environmental indicators.			
A1M13EMP	Ecology of materials and processes	Z,ZK	5
Electrical Technology from the perspective of ecology. Environmental assessment of the various types of surface protection. Environmental aspects of protective systems used in electronics. Environmental impacts of electrical production. Ekodesign proposal of the electrical product. Principles of the proposal product for a difficult operating environment. Disposal of electrical waste.			
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			
A1M16EUE	Economy of Energy Use	Z,ZK	5
Organization and energy management of company, buildings or energy systems. Energy need and consumption, energy balance. Energy characterization of aggregate, secondary energy sources. Energy audit and feasibility study, optimization of energy management of energy systems. Prices and tariffs, economy and financial analysis.			
A1M15ENY	Power Plants	Z,ZK	5
The subject introduces power plants of all kinds dimensioning and functions. It describes diagrams topologies, operational modes, control and safety problems solutions. It models dynamics and control of main part in all power plants types. It evaluates and describes control qualities and programmes.			
A1M14PO2	Electric Drives and Traction 2	Z,ZK	5
Electro mobiles and hybrid cars. Tire train and rolling resistance. Adhesion. Traction power. Locomotive traction power calculation for defined train load and track. Mass transportation vehicles. Tramway with resistive control, pulse control and induction motors. Tramway power-electronic converters. Trolley-busses. Metro. Electric locomotives - various designs. Locomotive power-converters. DC, AC and multi-system locomotives. AC motor locomotives. Diesel-electric locomotives			
A1M14SP2	Electric Machinery and Apparatus 2	Z,ZK	5
Contacts and semiconductor switching apparatus in LV networks. Basic topology of 3-phase switches and power load of its components. Power switches and systems with progressive semiconductor devices and its control circuits. Protective circuits of semiconductor switching devices. Electric apparatus testing. Continue. Fundamentals of general theory of electric machine. Magnetic field. Fundamentals of commutation. Transformer, efficiency, volt drop. Transient phenomena - switch to the network, cut-off. Mathematical model of synchronous and induction machine. Rotating magnetic field. Induction machine, starting and speed control. Magnetic field harmonics and their influence. Single-phase induction motor. Operation of the synchronous machine on the network. Torque, stability, overload capacity. Transient phenomena, cut-off			
A1M15EST	Electrical Light and Heat	Z,ZK	5
The aim of the first part of the course is to make students acquainted with most frequent applications of optical radiation, modern photometric and colorimetric devices used in practice, fundamentals of light control and design of dynamic lighting including new trends in light sources and luminaire progress. The aim of the second part of the course is to become students acquainted with heat transfer laws, heat pumps and problems of global optimization on electrical power engineering.			
A0M15EZS	Electrical Sources and Systems	Z,ZK	5
The subject is focused on the task of power quality, its operational criteria and improvement possibilities. There are also discussed specific tasks of dispersed generation and electrical systems. The student is then informed about basic electrical energy renewable sources and their connection possibilities to the system.			
A1M13EZF	Electrochemical Sources and Photovoltaics	Z,ZK	5
Photovoltaic sources. Operating principles, characteristics. Solar modules, construction and technology. Basic types of photovoltaic systems and their applications. Electrochemical sources of the electric power - overview. Primary cells and accumulators. Methods of accumulator charging. Sources for electrochemical production processes and their control. Automotive applications. Environmental aspects of the electrochemical sources and production processes.			
A0M31EOF	Electronic Circuits and Filters	Z,ZK	5
Subject deepens and consolidates knowledge in the field of analog electronic circuits and frequency-selection filters. Analytical procedures are the gist that lead from complete models of analog integrated circuit structures, through the simplification, to a deeper understanding of their characteristic. Design fundamental is obtained by the analysis of the dominant influences to the circuit activities. Design and realizations of analog filters is introduced in the next part.			
A0M34EZS	Electronic Security Systems	Z,ZK	5
The subject describes the system design, electronic solutions, conception characteristics, reliability and its increasing of electronic security and safety systems. It reports solutions of electronic sensor systems and methods of security system design, usage of modern electronic components and microprocessors. It offers practical applications suitable for safety systems of houses, cars, industry companies.			
A1M14ESZ	Power Machine Equipment	Z,ZK	4
Analysis of basic functions and operational accidents for power engineering. Quantitative and qualitative balance energy of machine equipment. Analysis of influence breakdowns of machine equipment, modes of regulation power output of power machine equipment. Operating optimisation. Operation properties of power machine equipment of power plant.			
A0M33EOA	Evolutionary Optimization Algorithms	Z,ZK	6
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.			
A1M16FIM	Financial Management	Z,ZK	6
Principles of finance, present value and alternative cost of capital, net present value, valuation of bonds and stocks, investment decision and net present value, risk and alternative cost of capital, risk and return, lease or buy, taxes, inflation and return, financial and real options, option valuation and application, hedging, short term finance, cash flow management.			
A1M16FIU	Financial Accounting	Z,ZK	5
Principles of accounting. Assets, inventory and financial investment book keeping. Debt and equity capital. Cost, revenues and profit. Tax system and accounting. Balance sheet, profit and loss account. Cash flow statement. Analysis of company's financial position. International accounting standards. Auditing, consolidated statements.			
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.			
A1M16MES	Management and Economics of Power Systems	Z,ZK	6
This course will give an overview of the various aspects of power supply with special emphasis on power management. The course characterises energy costs and marginal costs for determination of prices and tariffs. Energy market principles and operational decision making are integral parts of the course as well.			
A1M16MAV	Production Management	Z,ZK	5
The role of production process in promoting the marketing concept of the firm and the competitive advantage. The system of operational planning with respect to production typology. Standardized basis of production management, standardization. Controlling, production management methods.			
A1M16MEE	Management of Power Production	Z,ZK	5
Power plants and mining industry management and economics, energy balances and costs calculations of power production - electricity, steam, hot water, coal, liquid fuels, gas, economic loading of power plants, cost analysis			
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.			
A1M16MAR	Marketing	Z,ZK	5
The role and functions of the marketing management. Marketing research and marketing information system. Concepts of marketing strategy. The use of product life cycle and portfolio. Marketing-mix. Product and service policy, pricing and contractation policy, communication, distribution. Controlling and audit.			
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.			
A1M01MPE	Mathematics for Economy	Z,ZK	6
Aim of this subject is to give the basic informations about probability, mathematical statistics and Markov chains and to show their applications, mainly in insurance mathematics. At the end of the course, bases of cluster analysis will be shown.			
A3M01MKI	Mathematics for Cybernetics	Z,ZK	8
The goal is to explain basic principles of complex analysis and its applications. Fourier transform, Laplace transform and Z-transform are treated in complex field. Finally random processes (stacinary, markovian, spectral density) are treated.			
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 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.			
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 telecommunication 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 integraed structures (modules). Structures, function, characteristics and parameters, conditions for reliable operation. Connection of devices in parallel and in series. Operating reliability of power components and equipments.			
A0M37MOT	Advanced areas in image and video technology	KZ	5
This course presents the state-of-the-art techniques for digital image and video technology. These techniques and their applications cover almost all areas of technical professions dealing with human interaction. The content of lectures is being updated rapidly and continuously according to a remarkable progress in this field. The course deals with the principal functional blocks of mentioned systems both hardware and software implemented.			
A3M38MSZ	Modern Sensors and Signal Processing	Z,ZK	6
The course is aimed to broaden the sensors basics by topics necessary for design of sensors and sensor systems. Prospective sensor types are covered as well as methods of the processing of the sensor signal. Sensors and sensor systems are shown in applications and by case design studies. The labs are concentrated to the complex measurement of the sensor parameters and to FEM modeling and its experimental verification. Optical sensors and their applications are covered in detail by following course "Videometry".			
A4M36MAS	Multiagent Systems	Z,ZK	6
This course provides foundations of multi-agent systems and agent technologies. It provides a formal model of an agent, the concept of reactive, deliberative and deductive agent, BDI architecture,basics of inter agent communication and coordination. Introduction to distributed decision making and game theory will be also provided.			
A4M39MMA	Multimedia and Computer Animation	Z,ZK	6
The course is focused on methods often applied in the area of computer animation. Studens 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 optimalisation, are studied.			
A3M37NAV	Navigation	Z,ZK	6
Position determination and piloting of aircraft and space vehicles using instrumental navigation. Modern aircraft radio navigation, in particular satellite one. The explanation of the course respects recommendation of the European radio navigation plan (ERNP) and ICAO regulations. Student acquaints with navigation systems principles and with their 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.			
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 photonic 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.			

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 transtort, automatisasion and manipulating technics design. Selection, dimensionnong and realisation of drives components: power supply, switching devices, protection, semiconductor converter, electric motor. Project, verification of dimensionnong and testing of drive components, realisation of selected part on model drive, experimental parameters examination. Semestrial project optionally fixed on theoterical design, realisation or experimental parameters verification			
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).			
A4M39GPU	General-Purpose Computing on GPU	KZ	4
The goal of the course is to introduce students to basic principles of General-Purpose Computing on Graphics Processing Units (GPGPU). Course gives an overview of architecture and capabilities of modern graphics processing units (GPUs) and covers elementary concepts in parallel programming on GPUs. Students will gain programming skills with the CUDA (or OpenCL) technology and become familiar with basic parallel algorithms (e.g. parallel prefix scan/reduction) that are building blocks for design and implementation of efficient parallel algorithms.			
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
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.			
A1M16OVY	Operations Research	Z,ZK	5
Art of modeling and elements of decision models, Linear programming, Transportation problem, Integer linear programming, Introduction to graphs theory, Nonlinear programming, Dynamic programming, Monte Carlo simulation, Project management (CPM, PERT).			
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.			
A3M38PRS	Airborne Monitoring and Control Systems	Z,ZK	5
The course is designed for students of Aeronautics and Astronautics field of study. It provides detailed knowledge about airborne monitoring and control systems used on boards of aircrafts and spacecrafts. We cover subjects such as sensors, control and systems including: GPWS, ISN, FADEC, and EEC with important relation and trade-off problems. Full automatic monitoring and control systems of aircrafts' and spacecrafts ' propulsions wit aim on failure detection, isolation and recovery are taught together with problems introduced by the whole hierarchical structures of these systems and their digital networks. Partially it focuses on types of flight simulators and unmanned aerial vehicles, and military applications. The exercises allow students to create data fusion algorithms during hands-on experiments with wireless Attitude Heading and Reference System (AHRS) and a model of a satellite.			
A4M36PAH	Planning and game playing	Z,ZK	6
This course provides an introduction to classical AI planning (linear, nonliner 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.			
A1M16LOG	Business Logistics	Z,ZK	5
Logistics as an integrated system in the structure of business management. Logistics as a part of business strategy. Fundamentals of modern concepts and approaches in logistics. Management, cooperation in supply chain logistics, integrated control systems. Methods applied to flow control and evaluation of elementary parameters of logistics. Logistics market. Logistics integration including its legal, ecological and economical aspects.			
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.			
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.			
A4M39PGR2	Computer Graphics 2	Z,ZK	6
The course introduces advanced modeling and rendering techniques, capabilities of modern graphic accelerators, and methods for their programming. Focus is given on theoretical and practical experiences with OpenGL graphical library and with its extensions. Students learn GLSL language together with programming of graphical cards on the graphical pipeline level (vertex and fragment shaders).			
A3M35PSR	Real-Time Systems Programming	Z,ZK	6
The goal of this subject is to give students basic knowledge in the area of software design for embedded systems with real-time operating systems (RTOS) with emphasis to practical experience. Students will solve several simple tasks to get basic knowledge about RTOS VxWorks and to measure timing parameters of the RTOS and hardware, which are necessary when choosing a platform for a given application. Then a more complicated task (motor control) will be solved, which will fully utilize means of RTOS VxWorks. During lectures, students will become familiar with real-time systems theory, which can be used to formally prove the timing correctness of the applications. Moreover, some software engineering techniques, which help with increasing of quality of safety-critical systems will be discussed.			
A1M16PMG	Project Management	KZ	5
Processes and techniques for the preparation of entrepreneurial projects. Principles and methods of planning and operating of projects realization. Operating of the integration and project area. Operating of time, costs, sources, duality, human sources, communication, risks. Case study in the program Microsoft Project.			
A0M32PRD	Data Communication Means	Z,ZK	5
A0M13PRE	Industrial electronics	Z,ZK	5
Electronic components , resistors, capacitors, HF coils, transformers Semiconductor devices Mounting technologies Senzore, regulating equipments Power converters.HF heating equipments. Electromagnetic compatibility in power electronic.			
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.			
A3M38PSL	Aircraft and Spacecraft Instrumentation	Z,ZK	6
The course deals with a theory and description of basic functions, structures and principles of aircraft and spacecraft instrumentation working in a low-frequency band. Within the scope of this course it is possible to get knowledge about cockpit equipment, propulsion parameters measurements, aerometrical systems, and fuselage health monitoring systems. Furthermore, gyroscopic systems and systems for navigation are also covered. Laboratory exercises are orientated to get practical sense about theoretically learned knowledge about aircraft instrumentation.			
A4M39PUR	Psychology in HCI	KZ	4
The aim of the course is that students will master all phases of the research process starting from initial planning up to the translation of their observations into innovative design concepts, so they are able to run applied research projects themselves. Overall the emphasis is laid on practitioner's approach and developing skills needed for adopting these technique in daily design practice across various domains.			
A2M37RSY	Radio systems	Z,ZK	6
Radio systems and their parameters, radar and position determination systems especially. Principles, properties, parameters and applications.			
A4M39RSO	Realistic Image Synthesis	Z,ZK	6
We deal with techniques and algorithms for global illumination used in realistic rendering. The lectures partly complete the missing part of continuous mathematics required for this subject and numerical integration methods. The related physics underlying the rendering equation is shortly described which includes the surface reflectance. Most of the lectures are devoted to particular rendering algorithms for virtual and augmented reality. The use of GPUs for rendering algorithms are described within the last lectures.			
A1M16RES	Development of Energy Systems	Z,ZK	5
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 .			
A1M14RPO	Electric Drive Control	Z,ZK	5
Controlled electric drive, control computer of electric drive - system view, modulation methods, scalar control, quantity transformation, FOC control, DTC control, compatible rectifier, servo-drives, digital signal processing, discrete function, difference equation, digital filters, digital controllers, PSD controller, derivation and difference equation coefficients calculation, fixed point and floating point calculations, relative units and quantity normalization, digital signal processors, modulator hardware support, control algorithm implementation, microprocessor control system hardware implementation, protection circuitry, debugging, testing and monitoring			
A1M15RES	Control of Power Systems	Z,ZK	5
The subject introduces electrification system physical and economical characteristics and models. It deals with modes optimization, active and reactive power control in isolated and interconnected systems, extraordinary states solving and reliability evaluation. It describes also the current situation of the energy market liberalization and sources operation in it.			

A1M16JAK	Quality management	Z,ZK	5
Concept of Quality, History of quality management (QM), Current approaches to QM, Approach to quality in EU and CR, Quality management system (QMS) based on ISO 9001, Process management, Quality planning, Metrology in QM, Control of documents and records, Internal audits of QMS, Continual improvement of QMS, Integrated management, Statistic methods in QM, Accreditation and certification			
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.			
A1M14SOP	Simulation and Optimization in Drives	Z,ZK	5
Models of dynamic systems. Methods and process of simulation. Programs Pspice, Schematics and Probe. Circuit models of semiconductor converters. Dynamic models of converters in average values. Electric drive as a system. State space representation of models and its solution. Numerical methods and optimization. Models of converters and machines for high frequencies. Programs Matlab, Simulink. Methods of finite elements and its use for magnetic field optimization in electric machine. Development process and SW tools for design of main types of electric machines			
A1M13SVS	Simulation of Production Systems	Z,ZK	5
The course is focused at methods of static and dynamic models of processes and systems forming. Basic types of models are described and characterized. Models are built up using an analytical way on the basis of knowledge of relationships between parameters, or using an experimental way. Factorial experiments for qualitative variables are presented. Computer aided generation of mathematical models and simulation of dynamic behavior of processes and systems are described. Basic methods of component models compilation, assembly of a complete model are presented. The application on computer modeling and simulation of electrical, thermal and mechanical systems in power electrical engineering completes the lectures.			
A4M33SEP	A Practical Approach to Software	Z,ZK	6
The course A Practical Approach to The Software Engineering systematically covers primary and support software engineering activities. Further, software project management, software process, software maintenance and software proposal writing will be mentioned for an appropriate context. All topics covered will be illustrated on real world project situations. A typical lecture will include theory basics, minimal practices, checklists and templates, samples from real world projects and recommended reading.			
A0M15SZS	Reliability and Security of Power Systems	Z,ZK	5
The aim of the subject is acquiring basic knowledge of security and reliability of power electrical systems based on the deterministic and mainly probabilistic analysis. After the introductory summarisation and extension of the mathematical tools for probabilistic and statistic calculations, the methodology of evaluation of the reliability of the systems is mainly discussed starting from the reliability of its particular elements in various operation regimes. Attention is also paid to problems of maintenance and mathematical simulation of the destructive tests.			
A1M16STA	Statistical methods in economics	Z,ZK	5
Basic Concepts. Statistical series. Assortment. Distributions of frequencies. One-dimensional descriptive characteristics. Measures of variables, coefficient of skewness, coefficient of excess. Points estimates of basic characteristics. Interval estimates of basic characteristics. Hypothesis testing of basic characteristics. Individual indexes number. Aggregative indexes. Variable-structure indexes. Multifactor indexes . Correlation and regression, Basic Concepts. Measurement of dependence intensity. Time series, concepts, qualities. Chronological average . Time series - trends and extrapolation.			
A1M14SSE	Machinery structures of power plants	Z,ZK	4
The aim of subject is to acquaint with natural relations of energy conversions at power-producing premises, to describe functions of power-producing equipment, their structure, properties and characteristics.			
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.			
A1M16SIR	System Analysis and Decision Making	Z,ZK	5
System approach and decision making, Decision models, Games theory, Decision making under uncertainty and risk, Decisions with multiple objectives, Stochastic programming, Expert systems.			
A3M35SRL	Flight Control Systems	Z,ZK	6
The course is devoted to classical and modern control design techniques for autopilots and flight control systems. Particular levels are discussed, starting with the dampers, attitude angle stabilizers, to guidance and navigation systems. Next to the design itself, important aspects of aircraft modelling, both as a rigid body and considering flexibility of the structure, are discussed.			
A1M15TVN	High Voltage Engineering	Z,ZK	5
The subject introduces students with high voltage technique from point of view of its application in power engineering. It brings information about high voltage testing sources and the possibilities of measuring high voltages and big currents. It informs about high voltage insulation systems and methods for determining their states. There are explained particular types of electrical discharges and the possibilities of their elimination. Practical seminars are based on measurements in the high voltage laboratory.			
A1M13TPR	Technological Project Planning	Z,ZK	5
What is a project management? What is a life cycle of product and project? Project phases: Initial, Construct, Delivery and Support. Organisational structure. SWOT, PEST and 5P analyses. Workflow and business processes. Schedule, GANTT, PERT. Enterprise and project modelling. Management of documentation, recourses, quality and knowledge. Standards for exchange of product and business data. Enterprise ontology.			
A0M13TKS	Technology of Cables and Optical waveguides	Z,ZK	5
- Cable engineering-materials,machines and production methods - The engineering and properties of metal cables - The technology and properties of optical fibres and cables - The fibre connectors evaluation - Ending end branching of power cables - The power cables and optical fibres diagnostics			
A1M32TSY	Telecommunication Systems	Z,ZK	4
The subject discusses telecommunication networks from different perspectives - physical principles, structure, applications, etc. Students are introduced to elementary concepts and principles in the area of communications. The presented principles and methods are illustrated using examples of specific communication networks - ISDN, data transmission networks, fixed as well as mobile ones. Emphasis is put on applications related to power lines.			

A4M33TZ	Theoretical foundations of computer vision, graphics, and interaction	Z,ZK	6
We will explain fundamentals of image and space geometry including Euclidean, affine and projective geometry, the model of a perspective camera, image transformations induced by camera motion, and image normalization for object recognition. Then we will study methods of calculating geometrical objects in images and space, estimating geometrical models from observed data, and for calculating geometric and physical properties of observed objects. The theory will be demonstrated on practical task of creating mosaics from images, measuring the geometry of objects by a camera, and reconstructing geometrical and physical properties of objects from their projections. We will build on linear algebra, probability theory, numerical mathematics and optimization and lay down foundation for other subjects such as computational geometry, computer vision, computer graphics, digital image processing and recognition of objects in images.			
A4M01TAL	Theory of Algorithms	Z,ZK	6
The course brings theoretical background of the theory of algorithms with the focus at first on the time and space complexity of algorithms and problems, secondly on the correctness of algorithms. Further it is dealt with the theory of complexity; the classes P, NP, NP-complete, PSPACE and NPSPACE are treated and properties of them investigated. Probabilistic algorithms are studied and the classes RP and ZPP introduced.			
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.			
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.			
A2M01VKM	Selected chapters in mathematics	Z,ZK	8
The first part is devoted to some problems of matrix analysis, especially to properties connected with eigenvalues and eigenvectors of matrices. That is, for example, similarity of matrices, spectral decomposition and the singular value decomposition with applications. In the second part notions of partial differential equations and boundary value problems for partial differential equations are explained. Some concrete boundary value problems are considered and solved using Fourier method and using special function, in particular Bessel and Legendre spherical functions.			
A1M14VE2	Power Electronics 2	Z,ZK	5
Rectifiers with active load, discontinuous and continuous current, multiple commutation, three-phase AC/AC converters, electrostatic separators, welding rectifiers, battery chargers, superconductive magnetic energy reservoir, induction heating, reactive power compensation, contactless switches, softstarters, resistor pulse control, cathodic prevention, power transistor in switching mode, snubbers, structure and control principles of modern controlled drive, pulse width modulation methods, principles of vector control and direct control, pulse width modulated rectifiers, matrix converters, converter protection against current overload and against overvoltage			
A4M39VG	Computational Geometry	Z,ZK	6
The goal of computational geometry is analysis and design of efficient algorithms for determining properties and relations of geometric entities. The lecture focuses on geometric search, point location, convex hull construction for sets of points in d-dimensional space, searching nearest neighbor points, computing intersection of polygonal areas, geometry of parallelograms. New directions in algorithmic design. Computational geometry is applied not only in geometric applications, but also in common database searching problems.			
A1M13VES	Manufacturing of Electrical Components	KZ	4
Technology of electric components in general. Basic technology in use. Type of components: resistors, potentiometers, capacitors with foil dielectric. Ceramic and electrolytic capacitors. Electromechanical devices. Semiconductors, fabrication of vertical and horizontal structures. Packaging.			
A1M16VEN	Power and Heat Production	KZ	5
Power sources, energy processes, general power plant, power balance and characteristic curves. Review of energy production technologies (conventional and non conventional) - electricity, steam, hot water, coal, liquid fuels, gas. Power generation stations, their basic parts, their basic operational characteristic curves and calculations, operation, control. Environmental effects of power generating and actions of their minimization.			
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.			
A4M33VIA	Internet Applications Development	Z	3
This course will teach current Internet technologies and how to use them. We will show the growth of the Internet, sources of data and how to use them for WEB applications development. Text search is an essential web app and we will learn the basic techniques. We will focus on the most frequently used app on the web - search. We will explain the basics for the REST API design and usage. We will review the basic AJAX architecture from an application point of view. We also discuss knowledge DBs. We also plan to show conversational applications. The course will be closed with the introduction to Big Data and the Internet of Things.			
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
124INBB	Integrated Design of Buildings	Z,ZK	4
124KPKP	Building Structures - Final Review	ZK	4
124OSIB	Lighting and Acoustics	KZ	4
124ST1	Thermal Engineering in Construction 1	ZK	5
124ST2	Thermal Engineering 2	KZ	4
125DPIB	Diploma Thesis	Z	26
The thesis is the final article in which the student demonstrates the ability to independently handle the topic for the building services systems. The student consults his work with the supervisor of the thesis. Themes of work and type of treatment may be different.			
125EABI	Energy Audit of Building	KZ	4
Advanced course for introduction into energy auditing. Lectures topics: Energy audit and energy performance of buildings, legislation. EPDB - energy performance directive for buildings. Methodology of calculating energy performance of buildings. Energy audit - procedure and parts. Sankey energy flow diagram. Analysis of initial condition, description of initial condition object survey and survey of project documentation. Determining source efficiency, distribution and emission of heat. Steps towards reduction of energy consumption - building, heating, lighting, ventilating systems, technologies. Application of measures on a specific object. Synergic impact of energy saving measures. Economical evaluation, evaluation from the aspect of environment protection. Evaluation - emission Individual object survey. Energy audit of industrial objects. Methods of buildings evaluation. Seminar is focused on the realistic buildings resulting to presenting case study report about energy audit of existing building.			
125EIBB	Electroengineering and intelligent buildings	KZ	4
Construction of intelligent buildings (IB) is founded on mathematical-physical principles and draws from various definitions of IB. The information society, intelligent systems, new technologies, and nanotechnologies have significant impact on various system applications of technical equipment of buildings. The underlying idea is mainly energy and material saving and provision of the optimum parameters of indoor and outdoor environment. A new field rises, focused on user oriented building industry. Influence of electromagnetic environment, electromagnetic compatibility, implementation of intelligently operating equipment in buildings requires a systemic approach to solution of the whole complex of technical equipment of buildings. To let the students have a good grasp on new solutions within technical equipment of buildings and construction of IB, this subject aims to present a general view of such solutions. In a transparent form via examples, description of existing and future IB solutions, explanation of logical systems, including logical PLC control and IRC control of building on the room level, communications and implementation of fuzzy control shall be provided. New installation of LonWorks networks inside the building shall be described, same as intelligent ABB i-bus and KNX/EIB wiring, aimed at energy saving. The final part of the lectures shall concentrate on electronic access control and fire alarm security systems within the integrated control system.			
125ESB	Buildings Ecology Systems	KZ	4
Principles of environmentally friendly water management. Disposal of sewage water and use of rain water. Measurement of water consumption, system design, pumping devices, water saving and special installations.			
125ESBB	Building Energy Systems 1	ZK	4
Analysis and concept of building energy systems, focused on building energy distribution - water and steam heating systems, hot water generation.			
125OZEB	Renewable Energy Sources	ZK	4
The course deals with renewable energy sources and energy systems in buildings. The various types of energy are discussed in detail - solar, wind, biomass, geothermal and hydro. Described are the characteristics of energy utilization and appropriate ways.			
125PBZB	Fire Services	KZ	4
Fire water,hydrant systems,fire pipe,fire station.Fixed fire-fighting water with water mist, foam, and halon. Special fire-fighting equipment.Protecting buildings against fire spread from technological equipment.Electric fire alarm. Fire control equipment. Backup power source.			
125PIB1	Project 1	Z	6
The Project 1 is the subject of an inter-faculty field of Intelligent Buildings. Its content is focused on intelligent buildings to connect knowledge from undergraduate studies to other disciplines. Students in the project demonstrates the ability to independently handle project in intelligent buildings using a thorough analysis of current problems from the literature.			
125PIB2	Project 2	Z	6
The Project 2 is the subject of an inter-faculty field of Intelligent Buildings. Students in the project demonstrates the ability to independently handle project in intelligent buildings.			
125SYB	Building Systems	ZK	4
125TECE	Technological Units	KZ	4
Saunas, fireplaces, kitchen technology, elevators, heat pumps, technology, swimming pools, heat source and technological systems.			
2152038	Energy Sources and Conversions	KZ	4
2152060	Refrigeration Technique and Heat Pumps for Intelligent Buildings	KZ	4

2161102	Radiant and Industrial Heating Student will be informed about the basics of radiant and other industrial heating systems	Z,ZK	4
2161108	Transport Phenomena Basics of transport phenomena for the study programme Intelligent Buildings. Momentum, heat and mass transport in built environment.	Z,ZK	4
2161109	Automatic control in environmental engineering of building Application of basic approaches to automatic control of HVAC systems and equipments. Automatic control sequences of air conditioning and sources of heat.	Z,ZK	4
2161110	Air Conditioning and Industrial Ventilation Main functional elements of ventilation and air conditioning systems. Air conditioning systems. Ventilation systems for residential and technological rooms.	Z,ZK	4
2161567	Ventilation and Air Conditioning Main knowledge for design, control and evaluation of ventilation and air conditioning systems. Design according to demands for treatment of thermal and humidity state and quality of air in residential and technological rooms.	Z,ZK	4
2162035	Alternative Energy Sources Principles and basics of alternative energy sources use in buildings. Solar energy. Heat pumps. Biomass utilization.	KZ	4
2162064	Noise and Vibration Control Student will be informed about the basic acoustic dimensions, which are important for evaluation of noise.	KZ	4
2162114	Heating Supplemented knowledge from heating of residential and industrial buildings. Designing of convective and radiant heating systems.	KZ	4
2162115	Ventilation and Air Conditioning Main principles of ventilation and air conditioning. Source materials for design of systems. Natural ventilation, forced ventilation, air conditioning systems - output (capacity) and operation.	KZ	4
2162700	Experimental Methods 1 Introduction study of experimental technique in environmental engineering	KZ	4
2163033	Design IB I. Design of heating systems, heat distributors and systems for using recoverable source of energy. Design of ventilation and air conditioning systems, including gas cleaning and reduction of noise.	Z	6
2163034	Project IB II. Project and experimental solution of environmental devices. Optimization investment and operating costs, economic appraisal of ecologic investment.	Z	6
2163086	Thesis Thesis is final individual work. This work checks ability of logical independent technical thinking and treatment with technical materials. There is applied acquired knowledge from previous study periods.	Z	26
A0M13KTM	Construction and Technology of Microcomputers 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.	Z,ZK	5
A0M13MKV	Advanced Components of Power Electronic 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.	Z,ZK	5
A0M13PRE	Industrial electronics Electronic components, resistors, capacitors, HF coils, transformers Semiconductor devices Mounting technologies Sensore, regulating equipments Power converters. HF heating equipments. Electromagnetic compatibility in power electronic.	Z,ZK	5
A0M13TKS	Technology of Cables and Optical waveguides - 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	Z,ZK	5
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
A0M14DGP	Electric Drive Diagnostics 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	Z,ZK	5
A0M14DMP	Dynamics of mechanical parts of drives 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.	Z,ZK	4
A0M14KOP	Electric Drive Component Design 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	Z,ZK	5
A0M14KSP	Drive Communication Systems 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	Z,ZK	5

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			
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.			
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, architectonical considerations. Design of circuits for digital signal processing and arithmetic operations, design of processors and peripherals, low-power design techniques. Data synchronization and communication between asynchronous clock-domains			
A0M31ASN	Algorithms and Structures of Neurocomputers	Z,ZK	5
Information about the basic principles and possibility of the application of the neural informative technology for the signal processing are the main topic. The lectures are devoted to the introduction into the artificial neural networks (NN) theory and applications, to the choice and the optimisation of the structures, the choice of the data, and to the solutions of the classification. The neural network applications at the speech and image processing are investigated in detail. Some neural network applications in the biomedical engineering and hardware realization of the SOM are described. The applications are o focused to EEG and ECG processing, also to possibilities of applications ANN at physiotherapy,			
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 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.			
A0M32PRD	Data Communication Means	Z,ZK	5
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.			
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.			
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.			
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, algoritms coding/decoding, which contains in the communication chain. Dominantly is concentration to effective realization with minimal computing power.			
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.			
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.			
A1M01MPE	Mathematics for Economy	Z,ZK	6
Aim of this subject is to give the basic informations about probability, mathematical statistics and Markov chains and to show their applications, mainly in insurance mathematics. At the end of the course, bases of cluster analysis will be shown.			
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.			
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.			
A1M13TPR	Technological Project Planning	Z,ZK	5
What is a project management? What is a life cycle of product and project? Project phases: Initial, Construct, Delivery and Support. Organisational structure. SWOT, PEST and 5P analyses. Workflow and business processes. Schedule, GANTT, PERT. Enterprise and project modelling. Management of documentation, recourses, quality and knowledge. Standards for exchange of product and business data. Enterprise ontology.			
A1M13VES	Manufacturing of Electrical Components	KZ	4
Technology of electric components in general. Basic technology in use. Type of components: resistors, potentiometers, capacitors with foil dielectric. Ceramic and electrolytic capacitors. Electromechanical devices. Semiconductors, fabrication of vertical and horizontal structures. Packaging.			
A1M14ESZ	Power Machine Equipment	Z,ZK	4
Analysis of basic functions and operational accidents for power engineering. Quantitative and qualitative balance energy of machine equipment. Analysis of influence breakdowns of machine equipment, modes of regulation power output of power machine equipment. Operating optimisation. Operation properties of power machine equipment of power plant.			
A1M14PO2	Electric Drives and Traction 2	Z,ZK	5
Electro mobiles and hybrid cars. Tire train and rolling resistance. Adhesion. Traction power. Locomotive traction power calculation for defined train load and track. Mass transportation vehicles. Tramway with resistive control, pulse control and induction motors. Tramway power-electronic converters. Trolley-busses. Metro. Electric locomotives - various designs. Locomotive power-converters. DC, AC and multi-system locomotives. AC motor locomotives. Diesel-electric locomotives			
A1M14RPO	Electric Drive Control	Z,ZK	5
Controlled electric drive, control computer of electric drive - system view, modulation methods, scalar control, quantity transformation, FOC control, DTC control, compatible rectifier, servo-drives, digital signal processing, discrete function, difference equation, digital filters, digital controllers, PSD controller, derivation and difference equation coefficients calculation, fixed point and floating point calculations, relative units and quantity normalization, digital signal processors, modulator hardware support, control algorithm implementation, microprocessor control system hardware implementation, protection circuitry, debugging, testing and monitoring			
A1M14SOP	Simulation and Optimization in Drives	Z,ZK	5
Models of dynamic systems. Methods and process of simulation. Programs Pspice, Schematics and Probe. Circuit models of semiconductor converters. Dynamic models of converters in average values. Electric drive as a system. State space representation of models and its solution. Numerical methods and optimization. Models of converters and machines for high frequencies. Programs Matlab, Simulink. Methods of finite elements and its use for magnetic field optimization in electric machine. Development process and SW tools for design of main types of electric machines			
A1M14SP2	Electric Machinery and Apparatus 2	Z,ZK	5
Contacts and semiconductor switching apparatus in LV networks. Basic topology of 3-phase switches and power load of its components. Power switches and systems with progressive semiconductor devices and its control circuits. Protective circuits of semiconductor switching devices. Electric apparatus testing. Continue. Fundamentals of general theory of electric machine. Magnetic field. Fundamentals of commutation. Transformer, efficiency, volt drop. Transient phenomena - switch to the network, cut-off. Mathematical model of synchronous and induction machine. Rotating magnetic field. Induction machine, starting and speed control. Magnetic field harmonics and their influence. Single-phase induction motor. Operation of the synchronous machine on the network. Torque, stability, overload capacity. Transient phenomena, cut-off			
A1M14SSE	Machinery structures of power plants	Z,ZK	4
The aim of subject is to acquaint with natural relations of energy conversions at power-producing premises, to describe functions of power-producing equipment, their structure, properties and characteristics.			

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

A1M16MES	Management and Economics of Power Systems	Z,ZK	6
This course will give an overview of the various aspects of power supply with special emphasis on power management. The course characterises energy costs and marginal costs for determination of prices and tariffs. Energy market principles and operational decision making are integral parts of the course as well.			
A1M16OVY	Operations Research	Z,ZK	5
Art of modeling and elements of decision models, Linear programming, Transportation problem, Integer linear programming, Introduction to graphs theory, Nonlinear programming, Dynamic programming, Monte Carlo simulation, Project management (CPM, PERT).			
A1M16PMG	Project Management	KZ	5
Processes and techniques for the preparation of entrepreneurial projects. Principles and methods of planning and operating of projects realization. Operating of the integration and project area. Operating of time, costs, sources, duality, human sources, communication, risks. Case study in the program Microsoft Project.			
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.			
A1M16RES	Development of Energy Systems	Z,ZK	5
A1M16SIR	System Analysis and Decision Making	Z,ZK	5
System approach and decision making, Decision models, Games theory, Decision making under uncertainty and risk, Decisions with multiple objectives, Stochastic programming, Expert systems.			
A1M16STA	Statistical methods in economics	Z,ZK	5
Basic Concepts. Statistical series. Assortment. Distributions of frequencies. One-dimensional descriptive characteristics. Measures of variables, coefficient of skewness, coefficient of excess. Points estimates of basic characteristics. Interval estimates of basic characteristics. Hypothesis testing of basic characteristics. Individual indexes number. Aggregative indexes. Variable-structure indexes. Multifactor indexes . Correlation and regression, Basic Concepts. Measurement of dependence intensity. Time series, concepts, qualities. Chronological average . Time series - trends and extrapolation.			
A1M16VEN	Power and Heat Production	KZ	5
Power sources, energy processes, general power plant, power balance and characteristic curves. Review of energy production technologies (conventional and non conventional) - electricity, steam, hot water, coal, liquid fuels, gas. Power generation stations, their basic parts, their basic operational characteristic curves and calculations, operation, control. Environmental effects of power generating and actions of their minimization.			
A1M32TSY	Telecommunication Systems	Z,ZK	4
The subject discusses telecommunication networks from different perspectives - physical principles, structure, applications, etc. Students are introduced to elementary concepts and principles in the area of communications. The presented principles and methods are illustrated using examples of specific communication networks - ISDN, data transmission networks, fixed as well as mobile ones. Emphasis is put on applications related to power lines.			
A2M01PMS	Probability and Statistics	Z,ZK	8
The course covers probability and basic statistics. First classical probability is introduced, then theory of random variables is developed including examples of the most important types of discrete and continuous distributions. Next chapters contain moment generating functions and moments of random variables, expectation and variance, conditional distributions and correlation and independence of random variables. Statistical methods for point estimates and confidence intervals are investigated.			
A2M01VKM	Selected chapters in mathematics	Z,ZK	8
The first part is devoted to some problems of matrix analysis, especially to properties connected with eigenvalues and eigenvectors of matrices. That is, for example, similarity of matrices, spectral decomposition and the singular value decomposition with applications. In the second part notions of partial differential equations and boundary value problems for partial differential equations are explained. Some concrete boundary value problems are considered and solved using Fourier method and using special function, in particular Bessel and Legendre spherical functions.			
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 Course brings information about methods of signal processing used in multimedia including 2-D analysis and modern methods.	Z,ZK	5
A2M31ZRE	Speech processing 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 .	Z,ZK	6
A2M32MDS	Modeling and Dimensioning of Networks The aim of the course is to present an overlook of dimensioning of telecommunications net-works 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.	Z,ZK	6
A2M32MKS	Mobile Communication Networks 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.	Z,ZK	4
A2M32OSS	Optical Systems and Networks 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.	Z,ZK	5
A2M32RKP	Communication Processes Control 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.	Z,ZK	5
A2M32VAD	Design of Applications and DSP The subject makes familiar with selected parts of the digital signal processing in communication. The digital image processing is emphasized.	Z,ZK	5
A2M34MIM	Microsystems in Multimedia 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.	Z,ZK	5
A2M34MST	Microsystems 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.	Z,ZK	5
A2M34NAN	Nanoelectronics and Nanotechnology 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.	Z,ZK	5
A2M34NIS	Integrated Systems Design 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. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenches design and verification.	Z,ZK	5
A2M34SIS	Integrated System Structures 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.	Z,ZK	5
A2M37DKM	Digital communications 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.	Z,ZK	4
A2M37KDK	Coding in digital communications 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.	Z,ZK	5
A2M37OBT	Image Technology 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.).	Z,ZK	6
A2M37RSY	Radio systems Radio systems and their parameters, radar and position determination systems especially. Principles, properties, parameters and applications.	Z,ZK	6
A2M37ZVT	Audio Technology 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.	Z,ZK	5

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.			
A3M14AML	Aerodynamics and mechanics of flight	Z,ZK	6
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. There are discussed elements of propeller, jet and rocket propulsion and necessary conditions for airplane stability and control subject. Further subject deals with basic tasks of airplane performance, motion of spacecraft in space and its re-entry to earth surface.			
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.			
A3M35SRL	Flight Control Systems	Z,ZK	6
The course is devoted to classical and modern control design techniques for autopilots and flight control systems. Particular levels are discussed, starting with the dampers, attitude angle stabilizers, to guidance and navigation systems. Next to the design itself, important aspects of aircraft modelling, both as a rigid body and considering flexibility of the structure, are discussed.			
A3M37NAV	Navigation	Z,ZK	6
Position determination and piloting of aircraft and space vehicles using instrumental navigation. Modern aircraft radio navigation, in particular satellite one. The explanation of the course respects recommendation of the European radio navigation plan (ERNP) and ICAO regulations. Student acquaints with navigation systems principles and with their 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".			
A3M38PRS	Airborne Monitoring and Control Systems	Z,ZK	5
The course is designed for students of Aeronautics and Astronautics field of study. It provides detailed knowledge about airborne monitoring and control systems used on boards of aircrafts and spacecrafts. We cover subjects such as sensors, control and systems including: GPWS, ISN, FADEC, and EEC with important relation and trade-off problems. Full automatic monitoring and control systems of aircrafts' and spacecrafts ' propulsions wit aim on failure detection, isolation and recovery are taught together with problems introduced by the whole hierarchical structures of these systems and their digital networks. Partially it focuses on types of flight simulators and unmanned aerial vehicles, and military applications. The exercises allow students to create data fusion algorithms during hands-on experiments with wireless Attitude Heading and Reference System (AHRS) and a model of a satellite.			
A3M38PSL	Aircraft and Spacecraft Instrumentation	Z,ZK	6
The course deals with a theory and description of basic functions, structures and principles of aircraft and spacecraft instrumentation working in a low-frequency band. Within the scope of this course it is possible to get knowledge about cockpit equipment, propulsion parameters measurements, aerometrical systems, and fuselage health monitoring systems. Furthermore, gyroscopic systems and systems for navigation are also covered. Laboratory exercises are orientated to get practical sense about theoretically learned knowledge about aircraft instrumentation.			
A3M38SPD	Data Acquisition and Transfer	Z,ZK	6
Subject is devoted to distributed and centralized DAQ systems and to the design of their elements. Selected industrial interfaces and buses (CAN, Profibus, HART, Modbus, Ethernet), VXI/PXI systems, USB and wireless sensor networks (ZigBee, WiFi) are presented in detail in order to provide information required for efficient design of their components. Project-oriented laboratories provide students with practical experience in the implementation of modern DAQ systems.			

A3M38VBM	Videometry and Contactless Measurement	Z,ZK	6
This course explains the topics of optoelectronic sensors, especially CCD sensors, and their application in the videometry based contactless measurements. The problems of CCD line and area sensors, design of measuring cameras and the methods of signal processing are presented.			
A3M38VIP	Virtual Instruments	Z,ZK	6
A subject deals with programming virtual instruments based on standardized interfaces (PCI, PXI, VXI). Lectures are focused on application of up-to-date standards for data acquisition systems programming (VXIplug&play, VISA, IVI) and selected software techniques in Windows and Linux operating systems. Assigned software tasks in laboratories are solved using C/C++ language or LabVIEW environment.			
A3M38ZDS	Analog Signal Processing and Digitalization	Z,ZK	6
The course is dedicated to methods for preprocessing, digitalization and reconstruction of continuous signals. It is focused to the methods for achieving of high precision of transmission and suppression of spurious components. The laboratory exercises are divided into two parts: the first part is classical tasks; the second one is individual project of design of typically data acquisition system. The teaching is supported by the CAD system for measuring circuits.			
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.			
A4M33SEP	A Practical Approach to Software	Z,ZK	6
The course A Practical Approach to The Software Engineering systematically covers primary and support software engineering activities. Further, software project management, software process, software maintenance and software proposal writing will be mentioned for an appropriate context. All topics covered will be illustrated on real world project situations. A typical lecture will include theory basics, minimal practices, checklists and templates, samples from real world projects and recommended reading.			
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.			
A4M33VIA	Internet Applications Development	Z	3
This course will teach current Internet technologies and how to use them. We will show the growth of the Internet, sources of data and how to use them for WEB applications development. Text search is an essential web app and we will learn the basic techniques. We will focus on the most frequently used app on the web - search. We will explain the basics for the REST API design and usage. We will review the basic AJAX architecture from an application point of view. We also discuss knowledge DBs. We also plan to show conversational applications. The course will be closed with the introduction to Big Data and the Internet of Things.			
A4M34ISC	Systems on Chip	Z,ZK	6
Main responsibilities of integrated circuits designer; design abstraction levels - Y chart. Specification designation, feasibility study, criteria for technology and design kits selection. Analogue and digital integrated systems design and simulation methodologies. Main features of application specific ICs - full custom design, gate arrays, standard cells, programmable array logic. Design aspects mobile and low power systems. Hardware Description languages (HDL). Logic and physical synthesis. Front End and Back End design. Floorplanning, place and route, layout, parasitic extraction, time analysis, testbenche construction and verification.			

A4M35KO	Combinatorial Optimization	Z,ZK	6
The goal is to show the problems and algorithms of combinatorial optimization (often called discrete optimization; there is a strong overlap with the term operations research). Following the courses on linear algebra, graph theory, and basics of optimization, we show optimization techniques based on graphs, integer linear programming, heuristics, approximation algorithms and state space search methods. We focus on application of optimization in stores, ground transportation, flight transportation, logistics, planning of human resources, scheduling in production lines, message routing, scheduling in parallel computers.			
A4M35OSP	Open-source programming	Z,ZK	6
The subject provides insight into world of open-source projects and techniques proved to be usefull for larger applications and operating systems development. Reasons leading to the founding of GNU project is discussed and possible andwantages of this approach for cooperation even for commercial subjects is shown. Usual tools used for development, debugging and source code control and functional testing are described. Description of POSIX type operating system structure and introduction to the driver development, user-space libraries and user graphics environments comes next. The last topic is introduction how to use earlier described techniques and support for embedded applications development and real-time control.			
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.			
A4M36BIS	Information and System Security	Z,ZK	6
The goal of the course is to give the students a basic gasp of information/system security problems and solutions. Rather than teaching specific current technologies and vulnerabilities/threats, we will introduce general problems, formalize them if appropriate and illustrate them with a wide range of examples, both with current and legacy technologies. We put emphasis on problems that will be encountered by most programmers and developers through their careers.			
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.			
A4M39GPU	General-Purpose Computing on GPU	KZ	4
The goal of the course is to introduce students to basic principles of General-Purpose Computing on Graphics Processing Units (GPGPU). Course gives an overview of architecture and capabilities of modern graphics processing units (GPUs) and covers elementary concepts in parallel programming on GPUs. Students will gain programming skills with the CUDA (or OpenCL) technology and become familiar with basic parallel algorithms (e.g. parallel prefix scan/reduction) that are building blocks for design and implementation of efficient parallel algorithms.			
A4M39MMA	Multimedia and Computer Animation	Z,ZK	6
The course is focused on methods often applied in the area of computer animation. Studens 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).			
A4M39PGR2	Computer Graphics 2	Z,ZK	6
The course introduces advanced modeling and rendering techniques, capabilities of modern graphic accelerators, and metods for their programming. Focus is given on theoretical and practical experiences with OpenGL graphical library and with its extensions. Students learn GLSL language together with programming of graphical cards on the graphical pipeline level (vertex and fragment shaders).			
A4M39PUR	Psychology in HCI	KZ	4
The aim of the course is that students will master all phases of the research process starting from initial planning up to the translation of their observations into innovative design concepts, so they are able to run applied research projects themselves. Overall the emphasis is laid on practitioner's approach and developing skills needed for adopting these technique in daily design practice across various domains.			

A4M39RSO	Realistic Image Synthesis We deal with techniques and algorithms for global illumination used in realistic rendering. The lectures partly complete the missing part of continuous mathematics required for this subject and numerical integration methods. The related physics underlying the rendering equation is shortly described which includes the surface reflectance. Most of the lectures are devoted to particular rendering algorithms for virtual and augmented reality. The use of GPUs for rendering algorithms are described within the last lectures.	Z,ZK	6
A4M39VG	Computational Geometry 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.	Z,ZK	6
A4M39VIZ	Visualization 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.	Z,ZK	6
A5M02AKA	Acoustic Applications Lecture summarize applications in physical acoustics, room and building acoustics, environmental acoustics, noise and vibration control, physiological acoustics, diagnostics, and ultrasound.	KZ	4
A5M13AEZ	Application of Electrochemical Sources Electrochemical sources of the electric power - overview. Primary cells and accumulators. Methods of accumulator charging. Alternative sources of electrical energy. Uninterruptible power sources and their control. Sources for electrochemical production processes and their control. Environmental aspects of the electrochemical sources and production processes.	KZ	4
A5M13FVS	Photovoltaic Systems Solar energy and its exploitation using photovoltaic systems. Photovoltaic phenomena, solar cells and their characteristics, solar modules (construction, technology, parameters). Photovoltaic systems (including energy conservation). Photovoltaic system applications, optimisation of operating conditions. Basic economical and ecological aspects, present trends.	KZ	4
A5M13NZZ	Independent sources Electrochemical sources of the electric power - overview. Electrochemical sources (accumulators), applications. Uninterruptible power sources in IB. Other sources of the electrical energy. Perspective sources of electrical energy, storage of energy.	KZ	4
A5M13VSO	Solar Energy Utilization Solar energy. Photo-thermal phenomena. Photo-thermal power stations. Photovoltaic phenomena. Photovoltaic cells and modules and their characteristics. Photovoltaic systems and their applications. Significance, economic and environmental aspects of solar energy exploitation.	KZ	4
A5M14EPO	Electric Drives	KZ	4
A5M14RPI	Distribution of Electric Energy and Drives	Z,ZK	5
A5M14ZSE	Fundamentals of Power Electrical Engineering	KZ	4
A5M15ES1	Electrical Light 1	KZ	4
A5M16EUE	Economics of Energy Use Organization and energy management of company, buildings or energy systems. Energy need and consumption, energy balance. Energy characterization of aggregate, secondary energy sources. Energy audit and feasibility study, optimization of energy management of energy systems. Prices and tariffs, economy and financial analysis.	KZ	4
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
A5M33DSP	Databases, Networks and Programming Techniques	KZ	4
A5M33UIP	Advanced Artificial Intelligence The aim of the course is to provide an overview of advanced methods used at development of intelligent systems. The following topics are discussed: advanced methods of state space search, machine learning, data mining, nature inspired algorithms (PSO, ACO, evolutionary algorithms, artificial life), multiagent systems, and their applications.	KZ	4
A5M34ELE	Electronics	KZ	4
A5M34Ezs	Electronic security systems	KZ	4
A5M35DRS	Distributed Control Systems	Z,ZK	4
A5M38BEM	Electromagnetic compatibility	KZ	4
A5M38MEB	Measurements in the Buildings The students will learn about principles of measurement of basic physical quantities in the building. As the majority of the physical quantities are converted to the electrical signals, an overview of measurement of the electrical quantities is also presented. The subject is not intended for students who have already studied the subjects Electrical measurement and Sensors and transducers on CTU FEE.	KZ	4
A5M38SPD	Collection and data transfer	KZ	4
A5M38SZS	Sensors and Networks Applications of sensors in buildings	Z,ZK	4
A5M99DIP	Diploma Thesis	Z	26
A5M99PR1	Project 1 The topic of the thesis is chosen by the student and selected from the list of topics. "Project 1" is followed by "Project 2" with a higher difficulty. The assignment of the project is subject to the approval of the faculty guarantor or tutor. The work will be publicly presented.	Z	6
A5M99PR2	Project 2 The topic of the thesis is chosen by the student and selected from the list of topics. Project 2 mostly follows the topic of "Project 1" with a higher difficulty. The assignment of the project is subject to the approval of the faculty guarantor or tutor. The work will be publicly presented.	Z	6
AE0M33OSW	Ontologies and Semantic Web 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.	KZ	4
BEZM	Safety in Electrical Engineering for a master's degree The course provides for students of all programs periodic training guidelines for health and occupational safety and gives knowledge of electrical hazard of given branch of study. Students receive indispensable qualification according to the current Directive of the Dean.	Z	0

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