

Study plan

Name of study plan: Komunikace, multimédia a elektronika, p ed roz azením do obor

Faculty/Institute/Others: Faculty of Electrical Engineering

Department:

Branch of study guaranteed by the department: Common courses

Garantor of the study branch:

Program of study: Communications, Multimedia, Electronics

Type of study: Bachelor combined

Required credits: 152

Elective courses credits: 28

Sum of credits in the plan: 180

Note on the plan:

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 144

The role of the block: P

Code of the group: BBAP-K

Name of the group: Bachelor Thesis

Requirement credits in the group: In this group you have to gain at least 20 credits (at most 320)

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

Credits in the group: 20

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
AD0B14BAP	Bachelor thesis	Z	20		L	P
AD0B15BAP	Bachelor thesis	Z	20	28s	L	P
AD0B16BAP	Bachelor thesis	Z	20	28s	Z,L	P
AD0B17BAP	Bachelor thesis	Z	20	28s	L	P
AD0B31BAP	Bachelor thesis	Z	20		L	P
AD0B32BAP	Bachelor thesis	Z	20	0P + 28S	L	P
AD0B33BAP	Bachelor thesis	Z	20	28S	L	P
AD0B34BAP	Bachelor thesis	Z	20	28KC	L	P
AD0B35BAP	Bachelor thesis	Z	20	28S	L	P
AD0B36BAP	Bachelor thesis	Z	20	9s	L	P
AD0B37BAP	Bachelor thesis	Z	20	28s	L	P
AD0B38BAP	Bachelor thesis	Z	20	0P+28C	L	P
AD0B39BAP	Bachelor thesis	Z	20	9S	L	P
AD0B13BAP	Bachelor thesis	Z	20	28S	L	P
ABAP20	Bachelor thesis	Z	20	28s	L,Z	P

Characteristics of the courses of this group of Study Plan: Code=BBAP-K Name=Bachelor Thesis

AD0B14BAP	Bachelor thesis	Z	20
AD0B15BAP	Bachelor thesis	Z	20
AD0B16BAP	Bachelor thesis	Z	20
AD0B17BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination. Bachelor, s projects are oriented into microwave technique, antennas, propagation, optoelectronics, EMC, medical applications.			
AD0B31BAP	Bachelor thesis	Z	20
AD0B32BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			

AD0B33BAP	Bachelor thesis	Z	20
AD0B34BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B35BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B36BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study program. Student will choose a topic from a range of topics related to his or her branch of study that will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B37BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B38BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B39BAP	Bachelor thesis	Z	20
AD0B13BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study program. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
ABAP20	Bachelor thesis	Z	20

Code of the group: BKMEBBE-K

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

Requirement credits in the group:

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

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
AD2B14BP1	Safety in Electrical Engineering 1	Z	0	4+8j	Z,L	P
AD2B14BPZS	Basic health and occupational safety regulations	Z	0	2+2j	Z	P

Characteristics of the courses of this group of Study Plan: Code=BKMEBBE-K Name=Safety of the bachelor's studies

AD2B14BP1	Safety in Electrical Engineering 1	Z	0
The purpose of the course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it. In this way the students receive qualification of instructed person that enables them to work on electrical equipment according to the Directive of the Dean No. 1/2007			
AD2B14BPZS	Basic health and occupational safety regulations	Z	0
The guidelines were worked out based on The Training Scheme for Health and Occupational Safety designed for employees and students of the Czech Technical University in Prague, which was provided by the Rector's Office of the CTU. Safety is considered one of the basic duties of all employees and students. The knowledge of Health and Occupational Safety regulations forms an integral and permanent part of qualification requirements. Directive of the Dean No. 1/2007. This program is obligatory.			

Code of the group: BKMEP-K

Name of the group: Compulsory subjects of the programm

Requirement credits in the group: In this group you have to gain 118 credits

Requirement courses in the group: In this group you have to complete at least 23 courses

Credits in the group: 118

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
AD2B31ANO	Analog Circuits	Z,ZK	5	14KP+6KC	Z	P
AD2B32DAT	Data networks	Z,ZK	5	14P + 6C	Z	P
AD2B99DIT	Digital Engineering	Z,ZK	5	14P + 6L	Z	P
AD2B38EMB	Electrical Measurements and Instrumentation	Z,ZK	5	14P+6L	Z	P
AD2B17EPV	Electromagnetic Field, Waves and Lines	Z,ZK	5	14+6s	L	P
AD2B34ELP	Electron Devices	Z,ZK	5	14KP+6KL	L	P
AD2B99KAM	Communication and Multimedia	Z	5	14+6c	Z	P

AD2B99KOS	Communication Systems	Z,ZK	6	14P + 6L	L	P
AD2B37MMT	Multimedia Technology	Z,ZK	6	14+6L	L	P
AD2B17PMS	Fixed and Mobile Wireless Links	Z,ZK	6	14+6c	L	P
AD0B36PRI	Programming	Z,ZK	5	14KP+6KC	Z	P
AD2B13PEL	Industrial Electrical Engineering	Z,ZK	5	14KP+6KL	Z	P
AD2B34SEI	Sensors in Electronics and Informatics	Z,ZK	6	14KP+6KL	L	P
AD2B99SAS	Signals and systems	Z,ZK	5	14+6c	L	P
AD2B31ZEO	Fundamentals of Electrical Circuits	Z,ZK	5	14KP+6KS	L	P
AD0B01MA1	Introduction to Calculus	Z,ZK	8	21+9	Z	P

Characteristics of the courses of this group of Study Plan: Code=BKMEP-K Name=Compulsory subjects of the programm

AD2B31ANO	Analog Circuits	Z,ZK	5
The course is designed to acquaint students with the basics of analog electronic circuits. The first part is devoted to fundamental transistor amplifiers and elemental structures of analog integrated circuits. Then the typical applications of operational amplifiers are introduced, including non-linear networks and basic frequency filter design and implementation. Problems of oscillators are discussed at the conclusion.			
AD2B32DAT	Data networks	Z,ZK	5
The course introduces students to the basics of communication in a variety of data networks. The aim of the course is to provide a more comprehensive view of communication protocol for specific types most commonly used data networks according to the RM-layer OSI model. The course also allows students to look into ways of communicating with TCP/IP in the Internet, including the possibility of a practical realization of the data network in laboratory conditions using real equipment.			
AD2B99DIT	Digital Engineering	Z,ZK	5
The goal of this course is to provide the introduction into designing and realization of digital circuits. First, necessary mathematical apparatus, such as the Boolean algebra, Karnaugh maps, minimization and realization of logical functions is presented, followed by brief introduction into basics of logical circuits, such as the logical gates, flip-flops, TTL and CMOS logic etc. The second part is dedicated mainly to modern designing techniques of digital circuits using programmable FPGA and VHDL language. During these lessons, the basics of VHDL together with numerous examples are evaluated to provide a complex insight into this hardware description language and modern methods of designing and realization of digital circuits.			
AD2B38EMB	Electrical Measurements and Instrumentation	Z,ZK	5
Methods of measurement of electrical physical quantities (voltage, current, power, frequency, resistance, capacitance and inductance) are explained together with principles of their correct application and accuracy estimation. The course is closed by presenting information of several basic electronic measuring instruments and explaining fundamentals of magnetic measurements and basic information concerning measurement systems.			
AD2B17EPV	Electromagnetic Field, Waves and Lines	Z,ZK	5
This course presents fundamentals of electromagnetic field theory and its applications. Analysis methods proper for static, stationary as well as dynamic fields and waves in free space and on basic transmission lines are presented as well. This course provides students with physics - based view on studied effects, which is applied then on engineering problems. At the end of the course, all effects should not only be described, but quantified as well. Basic knowledge and insight into communication devices, systems and techniques is provided, applicable not only to systems currently taught in other courses, but to future systems as well.			
AD2B34ELP	Electron Devices	Z,ZK	5
This course introduces the basic theory, principles of operation and properties of electron devices. Physical principles of operation, device structures and characteristics are explained together with adequate models for small- and large-signal. Basic applications in analogue and digital electronics are examined. In seminars and labs, students are introduced to basic principles of device simulation, measurement of device characteristics and extraction of device parameters. Operation of electron devices in electronic devices is then analyzed using the PSpice simulator.			
AD2B99KAM	Communication and Multimedia	Z	5
The subject is focused on an introduction of 1st term students (Bc. study) to the field of communication and multimedia technology and electronics. This field is very broad and offers to students multidisciplinary (interdisciplinary) education. At the beginning of study it is important to inform students about different parts. The task is to do it in popular and acceptable form and show the most important parts of this very broad industrial and research branch. The area is covered by five departments providing educational and research inputs. This interdisciplinary subject demonstrates as an introduction to study expected job opportunities in IT, assistive, biomedical and other technologies.			
AD2B99KOS	Communication Systems	Z,ZK	6
The course gives an overview of the basic principles and methods used in digital communications in a variety of transmission environments (radio systems, metallic telecommunication lines, optical fiber). The students will learn the basic functional blocks of the communication systems, encoding and decoding, modulation and demodulation methods. The students obtain the idea about sources of errors in the transmission and ways for their detection and correction. They will learn how to calculate the theoretical and practical communication channel capacity, the basic parameters on digital interfaces measurement, including error rate and jitter.			
AD2B37MMT	Multimedia Technology	Z,ZK	6
This course is the introduction to multimedia technology (audio and video). It overviews sound and picture acquisition, signal processing, transmission and distribution, recording and reproduction including physiology of hearing and vision. It provides fundamental information for understanding the main principles for system solutions in the field.			
AD2B17PMS	Fixed and Mobile Wireless Links	Z,ZK	6
The goal of the course is to provide basic knowledge of the wireless transmission in real environments for specific applications, namely for the needs of the planning of wireless radio links. The key topics include: the wireless transmission, the link budget for various types of radio links, antenna parameters, basic types and applications of antennas, propagation of radio waves in the atmosphere for specific frequency bands and telecommunication services, propagation models for planning of fixed and mobile links for both terrestrial and satellite services, the interference and frequency planning, basics of cellular networks, ITU-R recommendations.			
AD0B36PRI	Programming	Z,ZK	5
The course is an introduction into basics programming using the Java language. Its core are data types, expressions, functions (exemplified by those at Java programming language), algorithms complexity evaluation, basics of programming techniques. In a comparative way the basic properties of language C are presented.			
AD2B13PEL	Industrial Electrical Engineering	Z,ZK	5
A student will, at first, meet with information about basic types of materials for electrical engineering, their properties, technologies and applications. The next task is focused on the fundamentals, function and service characteristics of transformers, power electronic converters, generators, DC and AC motors and contact electric apparatus. The problems are tested on the mains supply real units. The third part of the course deals with power electrical engineering, with the basic characteristic of a power system in the Czech Rep. and with types, operational modes and environmental impact of different types of power sources.			
AD2B34SEI	Sensors in Electronics and Informatics	Z,ZK	6
The subject describes basic physical, electronic as well as optoelectronic behaviours using in sensors and microsensors, static and dynamic parameters, improvement of parameters, sensor data processing, intelligent sensors, applications of basic principles in sensors (temperature, pressure, optoelectronic and fibre optic, radiation, chemical, mechanical, level, flow, ultrasound, etc.). There are showed principles and applications of MEMS and microsystems in the subject. Principles are demonstrated on actual sensor datasheets and applications.			
AD2B99SAS	Signals and systems	Z,ZK	5
Course explains basic terms and methods for continuous-time and discrete-time signal and system analysis.			

AD2B31ZEO	Fundamentals of Electrical Circuits	Z,ZK	5
The subject describes fundamental methods of electrical circuit analysis. After a brief introductory part where the difference between an electrical device and its models is introduced, the basic ideal passive and active circuit elements are then defined. Next, basic circuit quantities are defined; lectures are then focused on important laws and methods of analysis of electrical circuits. Circuit theorems, an analysis of DC circuits, AC circuits, first-order and second-order circuits are described. Finally, a brief description of more sophisticated methods of analysis (Laplace transform, pulse excitation) is done. The seminars are focused on getting a theoretical experience in analysis of electrical circuits, supplemented with simulations and simple measurement.			
AD0B01MA1	Introduction to Calculus	Z,ZK	8
This is an introductory course to calculus of real functions of one variable. In the first part we study limits and continuity of functions, derivative and its geometrical meaning, graphing of functions. Then we define the indefinite integral, and discuss basic integration methods, the definite integral and its applications. We conclude with an introduction to Laplace transform and its use in solving differential equations.			

Code of the group: BKMEPRO-K

Name of the group: Project I

Requirement credits in the group: In this group you have to gain 3 credits

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

Credits in the group: 3

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
AD2B31IN1	Project I.	KZ	3		Z	P
AD2B34IN1	Individual project	KZ	3	4KC	Z	P
AD2B17IN1	Individual Project	KZ	3	3s	Z	P
AD2B37IN1	Individual Project I	KZ	3	3S	Z	P
AD2B32TPR	Team Project	KZ	3	0P + 3S	Z	P

Characteristics of the courses of this group of Study Plan: Code=BKMEPRO-K Name=Project I

AD2B31IN1	Project I.	KZ	3
AD2B34IN1	Individual project Independent work in the form of a project. A student will choose a topic related to his or her branch of study, which will be specified department or branch departments. The project will be defended within the framework of a subject.	KZ	3
AD2B17IN1	Individual Project Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject. Projects deals with microwave technique, antennas, propagation, optical communications, EMC, and medical applications.	KZ	3
AD2B37IN1	Individual Project I Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.	KZ	3
AD2B32TPR	Team Project Teamwork in the form of project. The theme of work, the student selects from a menu of topics related to the specialization studied. Choice of theme, the student becomes a member of the team. Its task is to participate in collaboration with colleagues to solve the task.	KZ	3

Code of the group: BKMEPRO2-K

Name of the group: Project II

Requirement credits in the group: In this group you have to gain 3 credits

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

Credits in the group: 3

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
AD2B32IND	Individual Project	KZ	3	0P + 4S	Z,L	P
AD2B31IN2	Project II.	KZ	3		Z	P
AD2B34IN2	Individual project	KZ	3	4KC	Z	P
AD2B17IN2	Individual Project	KZ	3	4s	Z	P
AD2B37IN2	Individual Project II	KZ	3	4S	Z	P

Characteristics of the courses of this group of Study Plan: Code=BKMEPRO2-K Name=Project II

AD2B32IND	Individual Project Independent final work for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments.	KZ	3
AD2B31IN2	Project II.	KZ	3

AD2B34IN2	Individual project	KZ	3
Independent work in the form of a project. A student will choose a topic related to his or her branch of study, which will be specified department or branch departments. The project will be defended within the framework of a subject.			
AD2B17IN2	Individual Project	KZ	3
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject. Projects deals with microwave technique, antennas, propagation, optical communications, EMC, and medical applications.			
AD2B37IN2	Individual Project II	KZ	3
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.			

Code of the group: BKMEZAJ-K

Name of the group: Exam from the english language

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
A0B04B2Z	English language B2-exam	Z,ZK	0	0C	Z,L	P

Characteristics of the courses of this group of Study Plan: Code=BKMEZAJ-K Name=Exam from the english language

A0B04B2Z	English language B2-exam	Z,ZK	0
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Name of the block: Elective courses

Minimal number of credits of the block: 8

The role of the block: V

Code of the group: BKMEH-K

Name of the group: Humanities subjects

Requirement credits in the group: In this group you have to gain at least 8 credits (at most 24)

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
AD0B16ET1	Ethic	KZ	4	14+6s	L	v
AD0B16FI1	Philosophy I	KZ	4	14+6s	Z,L	v
AD0B16HI1	History I	KZ	4	14+6s	Z	v
AD0B16HT1	History of science and technology 1	KZ	4	14+6s	L	v
AD0B16MPS	Psychology	Z,ZK	4	14+6s	Z	v
A003TV	Physical Education	Z	2	0+2	L,Z	v

Characteristics of the courses of this group of Study Plan: Code=BKMEH-K Name=Humanities subjects

AD0B16ET1	Ethic	KZ	4
Aim of this subject is to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situations of human life. Essential parts of the subject are discussions in which students can react to lectures but also to actual questions coming with news and look for the communal answers.			
AD0B16FI1	Philosophy I	KZ	4
We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.			
AD0B16HI1	History I	KZ	4
The main purpose of this subject is to provide a historical overview and explanation of rises and developments of mass movements and totalitarian states in 20th century. The course is based on political and econom-social history with attention to philosophic and psychologic connections.			
AD0B16HT1	History of science and technology 1	KZ	4
This subject provides basic information on the development of science and technology in the world and at home from the earliest times to the present. The course is aimed primarily at explaining the significance of key levels of technology development, industrial revolutions and their impact on society.			
AD0B16MPS	Psychology	Z,ZK	4
A003TV	Physical Education	Z	2

Code of the group: BTV-K

Name of the group: T lesná výchova

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

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

Characteristics of the courses of this group of Study Plan: Code=BTV-K Name=T lesná výchova

TVV	Physical education	Z	0
TV-V1	Physical education	Z	1
TVV0	Physical education	Z	0

Code of the group: BTVK-K

Name of the group: T lovýchovné kurzy

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

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

Characteristics of the courses of this group of Study Plan: Code=BTVK-K Name=T lovýchovné kurzy

TVKZV	Physical Education Course	Z	0
TVKLV	Physical Education Course	Z	0

Code of the group: BKMEVOLPRE-K

Name of the group: Elective subjects

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách

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

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
AD0B14AMS	Actuators and Low Power Machines	Z,ZK	5	14+6L	L	v
AD3B35APE	Applied electronics	Z,ZK	6	14KP+6KC	L	v
AD0B36APO	Computer Architectures	Z,ZK	6	14KP+6KC	L	v
AD4B77ASS	Architectures of Software Systems	Z,ZK	6	14KP+6KC	L	v
AD3B35ARI	Automatic Control	Z,ZK	7	28KP+6KC	L	v
AD0B14AEE	Automotive Electrical and Electronic Engineering	Z,ZK	4	14+6L	L	v
AD4B33DS	Database Systems	Z,ZK	6	14KP+6KC	L	v
AD4B01DMA	Discrete mathematics	Z,ZK	7	14+6	Z	v
AD4B38DSP	Distributed Systems and Computer Networks	Z,ZK	6	14P+6L	L	v
AD3B33DRR	Dynamics and control of robots	Z,ZK	6	14KP+6KL	Z	v

AD0B13EKE	Ecology for Electrical	Z,ZK	4	14KP+6KL	Z	v
AD1B38EMA	Electrical Measurements	KZ	5	14P+6L	L	v
AD0B15EIN	Electrical Installations	Z,ZK	4	14+6L	L	v
AD1B31EOS	Electrical circuits	Z,ZK	6	21KP+6KS	L	v
AD3B31EOP	Electrical Circuits and Elements	Z,ZK	8	28KP+6KC	Z	v
AD1B14PO1	Electric Drives and Traction 1	Z,ZK	6	14+6L	Z	v
AD3B14EPR	Electric drive for automation and robotics	Z,ZK	6	14+6s	L	v
AD1B14SP1	Electric Machinery and Apparatus 1	Z,ZK	6	21+6L	Z	v
AD1B15EN1	Power Engineering 1	Z,ZK	5	14+6L	Z	v
AD1B15EN2	Power Engineering 2	Z,ZK	6	14+6s	L	v
AD1B15EN3	Power Engineering 3	Z,ZK	5	14+6s	L	v
AD1B17EMP	Electromagnetic Field	Z,ZK	5	14+6c	Z	v
AD4B34EM	Electronics and Microelectronics	Z,ZK	6	14KP+6KL	Z	v
AD0B13ETM	Electrotechnical materials	Z,ZK	4	14KP+3KL	L	v
AD1B14SEM	Seminar on Electrical Engineering	Z	2	0+14	Z	v
AD4B17EAM	Electromagnetism	Z,ZK	6	14+6c	Z	v
AD4B33FLP	Functional and Logic Programming	Z,ZK	6	14KP+6KC	L	v
AD0B13KEO	Construction of Electronic Circuits	Z,ZK	4	14KP+6KL	Z	v
AD3B33KUI	Cybernetics and Artificial Intelligence	Z,ZK	5	14KP+6KC	L	v
AD0B01LAG	Linear Algebra	Z,ZK	7	28+6	Z	v
AD0B01LGR	Logic and Graph Theory	Z,ZK	6	21+6	L	v
AD4B01MA2	Calculus	Z,ZK	8	28+6	L	v
AD1B15MAA	Mathematic Applications	Z,ZK	6	21+6c	L	v
AD3B01MA2	Mathematics 2	Z,ZK	7	28+6	L	v
AD0B13MTE	Materials and technology for electronics	Z,ZK	4	14KP+6KL	Z	v
AD3B38MMP	Microprocessors and Microcontrollers in Instrumentation	Z,ZK	6	14P+6L	L	v
AD1B14MIS	Microprocessors for Power Systems	Z,ZK	5	14+6L	Z	v
AD3B35MSD	Modeling and simulation of dynamic systems	Z,ZK	6	14KP+6KC	Z	v
AD0B13NNT	Nanotechnology	Z,ZK	4	14KP+6KC	Z,L	v
AD4B38NVS	Embedded Systems Design	Z,ZK	6	14P+6L	L	v
AD3B33OSD	Operating Systems and Databases	Z,ZK	6	21KP+6KC	L	v
AD4B33OSS	Operating systems and networks	Z,ZK	6	14KP+6KC	Z	v
AD4B33OPT	Optimization	Z,ZK	7	28KP+6KC	Z	v
AD0B13PTE	Advanced technology in electrical engineering	Z,ZK	5	14KP+6KC	L	v
AD4B32PKS	Computer and Communication Networks	Z,ZK	6	14P + 6C	Z	v
AD0B34PPN	Principles and Rules of Electronic Design.	Z,ZK	4	14KP+6KC	L	v
AD4B35PSR	Real-Time Systems Programming	Z,ZK	6	14KP+6KC	Z	v
AD0B15PES	Power Systems Operation	Z,ZK	5	14+6s	Z	v
AD1B13PPS	Industrial computer systems	Z,ZK	5	14KP+6KL	L	v
AD3B38PRT	Instrumentation for Data Acquisition and Proces Control	Z,ZK	6	14P+6L	Z	v
AD3B99RO	Robots	KZ	5	7KP+9KC	Z	v
AD3B33ROB	Robotics	Z,ZK	6	14KP+6KL	L	v
AD4B33RPZ	Pattern Recognition and Machine Learning	Z,ZK	6	14KP+6KC	Z	v
AD3B38SME	Sensors and Measurement	Z,ZK	6	21P+6L	L	v
AD0B14SPP	Drive Sensors	Z,ZK	4	14+6L	Z	v
AD4B33SI	Software Engineering	Z,ZK	6	14KP+6KC	Z	v
AD4B99SVP	Software or Research Project	KZ	6		Z,L	v
AD0B35SPS	Computer System Structures	Z,ZK	6	21KP+6KC	Z	v
AD0B13SPE	Welding and Soldering in Electrotechnics	KZ	4	14KP+6KL	L	v
AD1B13SVS	Solar Energy Application Systems	Z,ZK	5	14KP+6KL	L	v
AD0B14TDO	Technical Documentation	KZ	3	7+6L	Z	v

AD0B14TME	Engineering mechanics	Z,ZK	4	14+6s	L	v
AD3B31TES	Signal theory	Z,ZK	5	21KP+6KC	L	v
AD4B39TUR	Testing of user Interfaces	Z,ZK	6	14KP+6KC	L	v
AD1B01MA2	Multidimensional Analysis	Z,ZK	6	14+6	L	v
AD1B14VE1	Power Electronics 1	Z,ZK	5	14+6L	L	v
AD0B15VNZ	High-voltage Testing	Z,ZK	4	14+6L	Z	v
AD7B36TS1	Introduction to Software Testing	KZ	5	14KP+6KC	Z	v
AD4B33ZUI	Introduction to Artificial Intelligence	Z,ZK	6	14KP+6KC	L	v

Characteristics of the courses of this group of Study Plan: Code=BKMEVOLPRE-K Name=Elective subjects

AD0B14AMS	Actuators and Low Power Machines	Z,ZK	5	Principle, philosophy and characteristics actuator and small electrical machine used to drive native appliances, tackle, mechanic computers, recording and tape deck sound and visual techniques, servo - motors in automation engineering and in of other regions collective setting		
AD3B35APE	Applied electronics	Z,ZK	6	The main goal of this subject is acquirement of the knowledge for design of the real electronics equipments especially in area of the control systems and robotic. In comparison with analogical specialized theoretical subjects emphasis is placed on the practical application. Here the design of the schematic, choice of the suitable components, design of the printed circuit board and mechanical aspects will be explained.		
AD0B36APO	Computer Architectures	Z,ZK	6	Subject provides overview of basic building blocks of computer systems. Explanation starts from hardware side where it extends knowledge presented in the previous lectures of Structures of computer systems. Topics cover building blocks description, CPU structure, multiple processors interconnections, input/output subsystem and basic overview of network and buses topologies. Emphasis is placed on clarification of interconnection of hardware components with software support, mainly lower levels of operating systems, device drivers and virtualization techniques. General principles are more elaborated during presentation of examples of multiple standard CPU architectures. Exercises are more focused on the software view to the contrary. Students are lead from basic programming on CPU level to the interaction with raw hardware.		
AD4B77ASS	Architectures of Software Systems	Z,ZK	6	The objective of the course is to introduce the basic techniques of information system design and architecture. We will emphasize the use of standard design patterns in the distributed environments and concentrate on the general aspects of software systems, rather than on specific technologies or implementations.		
AD3B35ARI	Automatic Control	Z,ZK	7	Foundation course of automatic control. Introduction to basic concepts and properties of dynamic systems of physical, engineering, biological, economics, robotics and informatics nature. Basic principles of feedback and its use as a tool for altering the behavior of systems and managing uncertainty. Classical and modern methods for analysis and design of automatic control systems. Students specialized in systems and control will build on these ideas and knowledge in the advanced courses to follow. Students of other branches and programs will find out that control is a inspiring, ubiquitous and entertaining field worth of a future cooperation.		
AD0B14AEE	Automotive Electrical and Electronic Engineering	Z,ZK	4	Operational conditions for vehicle electronic equipment. Vehicle power sources. Laboratory training is oriented on practical measurement of basic assemblies and elements in vehicle equipment. Visit to the ŠKODA AUTO factory in Mladá Boleslav is included.		
AD4B33DS	Database Systems	Z,ZK	6	Database Systems and their architecture, query languages, transactions, object-relational mapping		
AD4B01DMA	Discrete mathematics	Z,ZK	7	In this course students meet some important topics from the field of discrete mathematics. Namely, they will explore divisibility and calculations modulo n, diophantine equations, binary relations, induction, cardinality of sets, and recurrence equations. The second aim of this course is to teach students the language of mathematics, both passively and actively, and introduce them to mathematics as science.		
AD4B38DSP	Distributed Systems and Computer Networks	Z,ZK	6	Subject is devoted to principles and technologies of distributed systems (DS) and to their employment in typical applications. Physical layer media, analog and digital modulations, DS topologies, MAC methods, coding and cryptography basics are introduced. Widely used standard systems are then presented together with their features. Internet protocols are explained and internetworking approaches presented. Finally the typical industrial applications of distributed systems are introduced.		
AD3B33DRR	Dynamics and control of robots	Z,ZK	6	The subject undrestands the robot as a dynamical system. Its design, identification, control and programming will be introduced. The methods can be used for other electromechanic systems, e.g., production machines and manipulation devices.		
AD0B13EKE	Ecology for Electrical	Z,ZK	4	Influence of the industrial production on the environment. Sources of gaseous and solid exhalation, pollution of effluents waste, sources of outlet and raw materials. Industrial technology from the ecological point. Degradation influence of environment. Technology of waste processing. Ecological management.		
AD1B38EMA	Electrical Measurements	KZ	5			
AD0B15EIN	Electrical Installations	Z,ZK	4	Basic design of electrical power circuit-wiring in housing and industrial building, wires dimension, introduction to protection and wire grounding in distribution point - low voltage and high voltage.		
AD1B31EOS	Electrical circuits	Z,ZK	6	The subject describes fundamental methods of electrical circuit analysis. The aim is to unify different level of knowledge of students coming from schools of different categories and form the basis of knowledge necessary for next subjects. It presents the difference among physical circuit and its models, and then it presents the behavior of basic ideal circuit elements in DC circuits and in sinusoidal steady state as well as transients, caused by changes in the circuit. Finally, it presents the brief description of more sophisticated methods of analysis (Laplace transform, pulse excitation ?).		
AD3B31EOP	Electrical Circuits and Elements	Z,ZK	8	The Subject deals with basic and most important principles of the electrical circuit analysis. It defines basic circuit variables and elements, and real components of actual electrical equipments. Subject deals with basic methods of the circuit analysis. It is oriented on basic thematic units of the analogue and digital technics that are necessary for the cybernetics and control technique study.		
AD1B14PO1	Electric Drives and Traction 1	Z,ZK	6	Application of motion equation in drives, the motor torque, the load torque, the dynamical torque. Operating modes, electromechanical transient effects. Drives with DC motors, induction motors, synchronous motors, SRM, EC motors, linear motors. For each type its properties, speed control strategy and block scheme of a controller, range of application. Drive control computer structure, shared resources organization, special hardware blocks for signal measurement and signal generation in drives, programming techniques and languages for software development and debugging, migration from analog signal processing to the digital signal processing, time sampling and amplitude quantization, aliasing, difference equations and digital control algorithms. Drive commissioning		

AD3B14EPR	Electric drive for automation and robotics	Z,ZK	6
Principle, philosophy and characteristics sources seat power control energy, changers for power supply small el. drive. Industrial automat used for drive el. drive. Small machinery and special electrical machine used in automatization and robots. Proposal electrical drive for automation application. Practical exhibits and check feature el. drive			
AD1B14SP1	Electric Machinery and Apparatus 1	Z,ZK	6
Electric drive and its components. Electromechanical energy conversion. Rotational converters - DC machines, induction motors, synchronous generators and motors. Special electric machines, actuators. Static converters - transformers. There are presented operational principles, main constructional scheme and characteristics, applications. Switching theory. Interaction between turn-off switch and switched circuit. Basic theory and characteristic of electric arc. Transient recovery voltage. Switching overvoltage. Low voltage protection apparatuses			
AD1B15EN1	Power Engineering 1	Z,ZK	5
The subject provides basic knowledge about the CR power system structure and operational characteristics and electrical power systems. Then it informs about the electric strength of insulators, machines and other power system devices. It presents knowledge about damaging phenomena of insulation systems and procedures for their elimination. It enables to meet insulation systems testing and diagnostics problems.			
AD1B15EN2	Power Engineering 2	Z,ZK	6
The subject is focused on the task of electrical energy transmission and distribution. It introduces particular components of electrical systems and their electrical parameters. It explains steady and failure states in ES and other transient events. It explains principles of electrical devices protections, dimensioning principles and electrical stations realization in the transmission and distribution system.			
AD1B15EN3	Power Engineering 3	Z,ZK	5
The aim of the course is to become students acquainted with heat transfer laws, the design and use of resistive, dielectric, induction and arc electro-heat devices, thermal comfort of human being, heating of interiors and examples of particular problems of electro-heat devices design and calculations. The next part of the course acquaints students with basics of photometry, light measurement, light sources, luminaires and fundamentals of indoor and outdoor lighting.			
AD1B17EMP	Electromagnetic Field	Z,ZK	5
This course gets its students acquainted with principles and applied electromagnetic field theory basics.			
AD4B34EM	Electronics and Microelectronics	Z,ZK	6
Semiconductors fundamentals, PN junction. Bipolar transistor, MOSFET structure. Fundamentals of Integrated systems processing technologies. CMOS technology, layout design, design rules. Analogue CMOS integrated circuits blocks, AD and DA converters. Memory structures. Micro-electro-mechanical systems. Optoelectronics devices.			
AD0B13ETM	Electrotechnical materials	Z,ZK	4
The main material characteristics as conductivity, permittivity, magnetic susceptibility etc. and their relations to the composition and structure are explained. The subject is concentrated namely on the metal conductors, semiconductors, dielectrics, magnetics and superconductors.			
AD1B14SEM	Seminar on Electrical Engineering	Z	2
The course summarizes the knowledge and shows practical use of electric energy from its production to its consumption. On the seminars, there are the basic fields of activity and related applications of following departments shown: Production and distribution of electric energy on the Department of Electroenergetics K13115, electric drives and actuators on the department of Electric Drives and Traction K13114, and the technology of production materials and equipment on the Department of Electrotechnology K13113.			
AD4B17EAM	Electromagnetism	Z,ZK	6
Based on theoretical fundamentals such as Maxwell equations, students will acquire insight into electromagnetic effects and ability to solve simple electromagnetic problems. Physical principles are applied to derive basics of circuit theory. Simple linear circuits, lumped as well as distributed, are described and analysed. Field theory application enables to understand basic circuit elements, such as resistors, capacitors, inductors, and transmission lines as well as important effects such as resonance and impedance matching. Exact quantitative description (analysis and/or design) of simple geometries helps to estimate fields and behaviour of more complex ones. Frequency domain and time domain formulations are combined to provide better insight. The course is completed by information on electromagnetic compatibility.			
AD4B33FLP	Functional and Logic Programming	Z,ZK	6
This course introduces students into the techniques of functional programming in the LISP (or more precisely SCHEME) and HASKELL language and logic programming in the PROLOG language. Both languages are declarative in that the programmer symbolically describes the problem to be solved, rather than enumerating the exact sequence of actions to be taken. In PROLOG, one describes the problem by specifying properties of objects and relations thereamong through logic formulas. In LISP, the problem description takes the form of function definitions. Both languages have found significant applications in artificial intelligence fields, such as agent systems or symbolic machine learning.			
AD0B13KEO	Construction of Electronic Circuits	Z,ZK	4
Printed circuit boards and modular constructions. Single sided, double sided and multi-layer boards. Through-hole and surface mount technologies. Designing printed circuits patterns. Passive and semiconductor components for electronic circuits. Manual and automated assembly. Soldering techniques. Testing of printed circuit boards during the manufacturing.			
AD3B33KUI	Cybernetics and Artificial Intelligence	Z,ZK	5
The course will enable students to understand the basic concepts, goals and methods of cybernetics and artificial intelligence, and align some individual topics studied in the bachelor stage into the more profound context of the study program. The syllabus contains topics concerned with general aspects of systems and information theory, problem solving and state space search principles, elements of game theory, knowledge and expert systems, elements of decision theory, recognition and machine learning. The most important feature of the course is its unifying conceptual approach to many, at first sight diverse, components of cybernetics and artificial intelligence.			
AD0B01LAG	Linear Algebra	Z,ZK	7
This course covers introductory topics of linear algebra. The main focus is on the related notions of linear spaces and linear transformations (linear independence, bases and coordinates) and matrices (determinants, inverse matrix, matrix of a linear mapping, eigenvalues). Applications include solving systems of linear equations, geometry in 3-space (including dot product and cross product), and solving linear differential equations.			
AD0B01LGR	Logic and Graph Theory	Z,ZK	6
AD4B01MA2	Calculus	Z,ZK	8
This is an introductory course to calculus. In the first part we study limits, continuity and derivative of real functions of one variable. Then we define the indefinite integral, discuss basic integration methods, the definite integral and its applications. We extend the discussion to real functions of more variables, partial derivatives and multiple integrals. We conclude with the study of real numerical series.			
AD1B15MAA	Mathematic Applications	Z,ZK	6
The aim of the course is to obtain knowledge about mathematic programs used in power engineering. Student becomes acquainted with technical methods for gathering and data analysis, SW and HW hierarchy of resources and applications examples. Student will acquire basic knowledge about MATLAB, MATHEMATICA and mathematical model assessment. Student becomes also acquainted with the fields of complex variable function and numerical methods for solving algebraic and differential equations.			
AD3B01MA2	Mathematics 2	Z,ZK	7
The subject covers an introduction to the differential and integral calculus in several variables and basic relations between curve and surface integrals. Other part contains function series and power series with application to Taylor and Fourier series.			
AD0B13MTE	Materials and technology for electronics	Z,ZK	4
Ability of creative application of materials in electronics is extended in the field of technology of their processing and the change of the properties of materials during their exploitations in electrical circuits, microelectronics, optoelectronic applications, sensors, actuators, superconductors, semiconductors, magnetic structures, and special applications. The processing technologies and the ageing processes are based on the relationships between composition, internal structure, and properties of materials.			

AD3B38MMP	Microprocessors and Microcontrollers in Instrumentation	Z,ZK	6
Applications of microprocessors and single chip microcontrollers in instrumentation techniques are presented in this course. The course is focused on describing function and programming in embedded applications.			
AD1B14MIS	Microprocessors for Power Systems	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			
AD3B35MSD	Modeling and simulation of dynamic systems	Z,ZK	6
The goal of the course is to teach you how to build control-oriented mathematical models of complex dynamic systems. The focus will be on modeling techniques that can glue together subsystems from diverse physical domains. We will show that the concept of energy (or power), which is universally valid across physical domains, is the right tool for combining electrical, mechanical, hydraulic, pneumatic, thermal and thermodynamic systems. Some of the methods presented in this course will be at least partially useful in the domains where the concept of energy is not so useful such as socio-economic systems. In total we will introduce three groups of modeling techniques, which are based on the concept of energy. Analytical methods based on the Lagrangean and Hamiltonian functions well known from the studies in theoretical physics and/or mechanics, object-oriented modeling as an alternative to the more widespread block-oriented modeling, and last but not least an intuitive graphical techniques known as bond graph modeling. Whichever methodology is followed to create the mathematical model, of the ways to analyze it is a numerical simulation, that is, numerical solution of the corresponding differential or differential-algebraic equations. In this course we will be exposed to the basics of numerical techniques for differential and differential-algebraic equations with the objective to understand the basic issues such as approximation errors, numerical stability and suitability of the common methods for different classes of models.			
AD0B13NNT	Nanotechnology	Z,ZK	4
The course is under way of essential convergence of the nano-bio-info fields in nanoscale. The lectures are focused on the characterization of nanostructures, growth of fractals and nanostructures and self-assembly of nanostructures, top-down and bottom-up processes, nanomaterials like nanotubes and graphene, application in nano-electro-mechanical systems, new materials, medicine, new sources of energy, and bio-inspired nano-structures like artificial tissues. Effects of the nanoscale onto sintering processes and plasma treatments of materials are discussed.			
AD4B38NVS	Embedded Systems Design	Z,ZK	6
The main aim of this subject is design of embedded systems using microcontrollers. It is mainly focused on 32-bit (alter. 8-bit) microcontrollers and DSP, supporting logic devices, external input/output devices and the other supporting devices.			
AD3B33OSD	Operating Systems and Databases	Z,ZK	6
The goal of this course is to introduce basic concepts and principles of operating systems (OS), like processes and threads, their scheduling, mutual communication and synchronization, time-dependent errors and deadlocks. Attention is also paid to memory management, virtual memory, management of secondary storages, file-systems and data security. The second part of the course is focused at databases, their types and structures, concurrent data access and transactions.			
AD4B33OSS	Operating systems and networks	Z,ZK	6
The goal of this course is to introduce basic concepts and principles of operating systems (OS), like processes and threads, their scheduling, mutual communication and synchronization, time-dependent errors and deadlocks. Attention is also paid to memory management, virtual memory, management of secondary storages, file-systems and data security. The second part of the course is focused at distributed systems (DS) principles and technologies. DS communication media and topologies are explained and the basics of Internet including specific protocols are treated as typical DS applications.			
AD4B33OPT	Optimization	Z,ZK	7
The course provides the basics of mathematical optimization: using linear algebra for optimization (least squares, SVD), Lagrange multipliers, selected numerical algorithms (gradient, Newton, Gauss-Newton, Levenberg-Marquardt methods), linear programming, convex sets and functions, intro to convex optimization, duality.			
AD0B13PTE	Advanced technology in electrical engineering	Z,ZK	5
The topic of subject is oriented on selected materials and technics which are offering a new properties and facilities to electrical products. New superconductive materials, special pure polymers and their composites, materials with memory of form, intelligent polymers, materials and structures based on nanoparticles. Selected types of beam technics and their use in practice.			
AD4B32PKS	Computer and Communication Networks	Z,ZK	6
The aim of the course is to familiarize students with current trends in the switched local networks and the key functions of routing protocols in IP networks. The second part of the course introduces students to concepts of ensuring the information security in the communication networks. An integral part of the course is also an explanation of the principles for ensuring the adequate quality of services in data networks and features of some file sharing application protocols. The course is aimed rather primarily practically than theoretically			
AD0B34PPN	Principles and Rules of Electronic Design.	Z,ZK	4
Introduction to principles of electronic design. Reliability, compatibility, testability, safety. General design rules for professional electronic design with superior ratings in terms of high frequency and high current, immunity to a disturbance, low-level electromagnetic emission, etc. Miniaturization and cost minimization. Education of electronic design methodology in favour of creativity instead of specialization on specific devices and systems. Hands-on approach with aid of modern computer design tools.			
AD4B35PSR	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.			
AD0B15PES	Power Systems Operation	Z,ZK	5
The subject deals with legislative and technical conditions of electrical power systems operation. It covers systems operation at all voltage levels, basic system quantities control at both supply and consumption side, system dispatching control. It also informs about systems interconnection and extraordinary states.			
AD1B13PPS	Industrial computer systems	Z,ZK	5
The subject is focused on basic knowledges about computer control systems used in electrotechnic engineering and energetics. Students works with hardware for data acquisition and data processing, software tools and application examples. There are presented elementary digital circuits, the representation of numbers and their processing in microcomputer and fundamental block of microprocessor and microcomputer. The single chip microcomputer, embedded application, industrial PC and design to industrial condition are presented.			
AD3B38PRT	Instrumentation for Data Acquisition and Proces Control	Z,ZK	6
An automation of production, quality control or research and development are based on the use of data acquisition systems. Different types of standardized systems, their parameters, programming, and applications are described here. Laboratories are pointing to the programming of frequently used systems using different developing tools. Survey of the evaluation of teaching at FEE: http://www.fel.cvut.cz/anketa/aktualni/courses/AE3B38PRT			
AD3B99RO	Robots	KZ	5
AD3B33ROB	Robotics	Z,ZK	6
Robotics is an integrating discipline designing and exploring machines with high degree of flexibility and autonomy. The subject introduces the discipline. It will briefly present broader context of robotics first and after that will teach students kinematics and statics of robots.			

AD4B33RPZ	Pattern Recognition and Machine Learning	Z,ZK	6
The basic formulations of the statistical decision problem are presented. The necessary knowledge about the (statistical) relationship between observations and classes of objects is acquired by learning on the raining set. The course covers both well-established and advanced classifier learning methods, as Perceptron, AdaBoost, Support Vector Machines, and Neural Nets.			
AD3B38SME	Sensors and Measurement	Z,ZK	6
Basic circuits and instruments for measurement of electrical quantities, AD and DA converters, sensors focused to use in robotics and automation, intelligent sensors, methods of decreasing uncertainties.			
AD0B14SPP	Drive Sensors	Z,ZK	4
Electric and non-electric quantity sensors for drives, Basic sensors types - physical principles. Theoretical fundamentals, practical choice of suitable sensor, sensor output electrical circuit, sensor output signal processing, digital signal processing and noise suppression. Sensor output signal time characteristics and frequency characteristics. Practical lab verification of theoretical principles			
AD4B33SI	Software Engineering	Z,ZK	6
The aim of this course is to provide the basic orientation in the software development process in order to be able to act effectively as a developmnet team members. The students will become knowledgeable in the core techniques of software design, support tools for the software development and selected project management and risk control procedures.			
AD4B99SVP	Software or Research Project	KZ	6
AD0B35SPS	Computer System Structures	Z,ZK	6
The subject introduces into basic hardware structures of computer systems, into their design and architecture. It explains technical background of classic computer systems and special computer for digital and logic control. It gives greater insight into parallel processing of data in computers. Students obtain credits from practical exercises according to results of individual projects. The projects are solved on FPGA development boards Altera DE2 that are utilized in similar courses by many world's top universities.			
AD0B13SPE	Welding and Soldering in Electrotechnics	KZ	4
Subject deals with modern methods of welding and soldering of metals in area of electrotechnics and electronics. There are presented technologies gas-welding, arc-welding, gas shielded welding, plasma welding, electron beam and laser welding, resistance and hf welding. A spatial attention is paid to the soldering and wire bonding in microelectronics. Practical exercises provide the basic workshop of arc welding.			
AD1B13SVS	Solar Energy Application Systems	Z,ZK	5
Solar energy. Photovoltaic phenomena. Photovoltaic cells and modules and their characteristics. Photovoltaic systems and their applications. Photo-thermal phenomena. Photo-thermal power stations. Significance, economic and environmental aspects of solar energy exploitation.			
AD0B14TDO	Technical Documentation	KZ	3
In the subject TECHNICAL DOCUMENTATION students are acquainted with creation and defending of graphical and text technical documentation and with professional presentation in electro technical projects and design. Students are taught to fundamentals of technical drawing (projection methods, representation, sectional views, dimensioning, qualitative parameters etc.), to technical standards, to creation of graphical documentation in electro-technical branches, to creation of technical text documentation. In one half of seminars are students acquainted with basics of the graphic editor AutoCAD			
AD0B14TME	Engineering mechanics	Z,ZK	4
This subject provides knowledge of applied mechanics for the industry practice. Analysis of constructional elements and their dimensioning. Kinematics of simple mechanisms. Dynamic behaviour of mechanical systems, mechanic vibrations. Thermodynamics of real gases and vapours, their processes an cycles, basic comparative cycles of heat machines. Fundamentals of hydrodynamics, transport losses in hydraulic systems.			
AD3B31TES	Signal theory	Z,ZK	5
Course explains basic terms and methods for continuous-time and discrete-time signal and system analysis.			
AD4B39TUR	Testing of user Interfaces	Z,ZK	6
Students will be acquainted with fundamental principles of testing of user interfaces. The lectures will cover the most important topics in this particular field in necessary extent. This extent will allow the students to test user interfaces in a given context that is defined, besides other aspects, by life cycle of software products. Important part of the course are issues dealing with user interfaces for special classes of user interfaces (handicapped users, user interfaces for mobile devices etc.). In the framework of seminars and labs the students will go through the whole design cycle beginning with the design of a particular user interface and ending up with its testing and subsequent evaluation. The testing will be done in usability lab that is at disposal in the department. [an-a4,ad4,ae4]			
AD1B01MA2	Multidimensional Analysis	Z,ZK	6
The aim of the course is to introduce students to basics of differential and integral calculus of functions of more variables and to basics of series of numbers and functions.			
AD1B14VE1	Power Electronics 1	Z,ZK	5
Power semiconductor devices, their serial and parallel connection, voltage and current dimensioning, point-to-point and bridge rectifiers, reversible rectifiers, control pulse generators, AC/AC and DC/DC converters, voltage source inverters, current source inverters, resonance inverters, frequency converters, matrix converters, principles of electromagnetic compatibility, cooperation of power semiconductor converters with DC and AC motors, survey of power semiconductor converters application in engineering practice			
AD0B15VNZ	High-voltage Testing	Z,ZK	4
The aim of the subject is the introduction of metrological system and testing procedures in the field of high voltage techniques. It brings overview of modern diagnostic methods that are applied in electrical power systems. The subject opens questions in evaluation and interpretation of test results from the application of diagnostic methods and high-voltage tests.			
AD7B36TS1	Introduction to Software Testing	KZ	5
AD4B33ZUI	Introduction to Artificial Intelligence	Z,ZK	6
This course provides introduction to symbolic artificial intelligence. It presents the algorithms for informed and non-informed state space search, nontraditional methods of problem solving, knowledge representation by means of formal logic, methods of automated reasoning and introduction to markovian decision making.			

List of courses of this pass:

Code	Name of the course	Completion	Credits
A003TV	Physical Education	Z	2
A0B04B2Z	English language B2-exam	Z,ZK	0
ABAP20	Bachelor thesis	Z	20

AD0B01LAG	Linear Algebra	Z,ZK	7
This course covers introductory topics of linear algebra. The main focus is on the related notions of linear spaces and linear transformations (linear independence, bases and coordinates) and matrices (determinants, inverse matrix, matrix of a linear mapping, eigenvalues). Applications include solving systems of linear equations, geometry in 3-space (including dot product and cross product), and solving linear differential equations.			
AD0B01LGR	Logic and Graph Theory	Z,ZK	6
AD0B01MA1	Introduction to Calculus	Z,ZK	8
This is an introductory course to calculus of real functions of one variable. In the first part we study limits and continuity of functions, derivative and its geometrical meaning, graphing of functions. Then we define the indefinite integral, and discuss basic integration methods, the definite integral and its applications. We conclude with an introduction to Laplace transform and its use in solving differential equations.			
AD0B13BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study program. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B13EKE	Ecology for Electrical	Z,ZK	4
Influence of the industrial production on the environment. Sources of gaseous and solid exhalation, pollution of effluents waste, sources of outlet and raw materials. Industrial technology from the ecological point. Degradation influence of environment. Technology of waste processing. Ecological management.			
AD0B13ETM	Electrotechnical materials	Z,ZK	4
The main material characteristics as conductivity, permittivity, magnetic susceptibility etc. and their relations to the composition and structure are explained. The subject is concentrated namely on the metal conductors, semiconductors, dielectrics, magnetics and superconductors.			
AD0B13KEO	Construction of Electronic Circuits	Z,ZK	4
Printed circuit boards and modular constructions. Single sided, double sided and multi-layer boards. Through-hole and surface mount technologies. Designing printed circuits patterns. Passive and semiconductor components for electronic circuits. Manual and automated assembly. Soldering techniques. Testing of printed circuit boards during the manufacturing.			
AD0B13MTE	Materials and technology for electronics	Z,ZK	4
Ability of creative application of materials in electronics is extended in the field of technology of their processing and the change of the properties of materials during their exploitations in electrical circuits, microelectronics, optoelectronic applications, sensors, actuators, superconductors, semiconductors, magnetic structures, and special applications. The processing technologies and the ageing processes are based on the relationships between composition, internal structure, and properties of materials.			
AD0B13NNT	Nanotechnology	Z,ZK	4
The course is under way of essential convergence of the nano-bio-info fields in nanoscale. The lectures are focused on the characterization of nanostructures, growth of fractals and nanostructures and self-assembly of nanostructures, top-down and bottom-up processes, nanomaterials like nanotubes and graphene, application in nano-electro-mechanical systems, new materials, medicine, new sources of energy, and bio-inspired nano-structures like artificial tissues. Effects of the nanoscale onto sintering processes and plasma treatments of materials are discussed.			
AD0B13PTE	Advanced technology in electrical engineering	Z,ZK	5
The topic of subject is oriented on selected materials and technics which are offering a new properties and facilities to electrical products. New superconductive materials, special pure polymers and their composites, materials with memory of form, intelligent polymers, materials and structures based on nanoparticles. Selected types of beam technics and their use in practice.			
AD0B13SPE	Welding and Soldering in Electrotechnics	KZ	4
Subject deals with modern methods of welding and soldering of metals in area of electrotechnics and electronics. There are presented technologies gas-welding, arc-welding, gas shielded welding, plasma welding, electron beam and laser welding, resistance and hf welding. A spatial attention is paid to the soldering and wire bonding in microelectronics. Practical exercises provide the basic workshop of arc welding.			
AD0B14AEE	Automotive Electrical and Electronic Engineering	Z,ZK	4
Operational conditions for vehicle electronic equipment. Vehicle power sources. Laboratory training is oriented on practical measurement of basic assemblies and elements in vehicle equipment. Visit to the ŠKODA AUTO factory in Mladá Boleslav is included.			
AD0B14AMS	Actuators and Low Power Machines	Z,ZK	5
Principle, philosophy and characteristics actuator and small electrical machine used to drive native appliances, tackle, mechanic computers, recording and tape deck sound and visual techniques, servo - motors in automation engineering and in of other regions collective setting			
AD0B14BAP	Bachelor thesis	Z	20
AD0B14SPP	Drive Sensors	Z,ZK	4
Electric and non-electric quantity sensors for drives, Basic sensors types - physical principles. Theoretical fundamentals, practical choice of suitable sensor, sensor output electrical circuit, sensor output signal processing, digital signal processing and noise suppression. Sensor output signal time characteristics and frequency characteristics. Practical lab verification of theoretical principles			
AD0B14TDO	Technical Documentation	KZ	3
In the subject TECHNICAL DOCUMENTATION students are acquainted with creation and defending of graphical and text technical documentation and with professional presentation in electro technical projects and design. Students are taught to fundamentals of technical drawing (projection methods, representation, sectional views, dimensioning, qualitative parameters etc.), to technical standards, to creation of graphical documentation in electro-technical branches, to creation of technical text documentation. In one half of seminars are students acquainted with basics of the graphic editor AutoCAD			
AD0B14TME	Engineering mechanics	Z,ZK	4
This subject provides knowledge of applied mechanics for the industry practice. Analysis of constructional elements and their dimensioning. Kinematics of simple mechanisms. Dynamic behaviour of mechanical systems, mechanic vibrations. Thermodynamics of real gases and vapours, their processes an cycles, basic comparative cycles of heat machines. Fundamentals of hydrodynamics, transport losses in hydraulic systems.			
AD0B15BAP	Bachelor thesis	Z	20
AD0B15EIN	Electrical Installations	Z,ZK	4
Basic design of electrical power circuit-wiring in housing and industrial building, wires dimension, introduction to protection and wire grounding in distribution point - low voltage and high voltage.			
AD0B15PES	Power Systems Operation	Z,ZK	5
The subject deals with legislative and technical conditions of electrical power systems operation. It covers systems operation at all voltage levels, basic system quantities control at both supply and consumption side, system dispatching control. It also informs about systems interconnection and extraordinary states.			
AD0B15VNZ	High-voltage Testing	Z,ZK	4
The aim of the subject is the introduction of metrological system and testing procedures in the field of high voltage techniques. It brings overview of modern diagnostic methods that are applied in electrical power systems. The subject opens questions in evaluation and interpretation of test results from the application of diagnostic methods and high-voltage tests.			
AD0B16BAP	Bachelor thesis	Z	20

AD0B16ET1	Ethic	KZ	4
Aim of this subject is to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situations of human life. Essential parts of the subject are discussions in which students can react to lectures but also to actual questions coming with news and look for the communal answers.			
AD0B16FI1	Philosophy I	KZ	4
We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.			
AD0B16HI1	History I	KZ	4
The main purpose of this subject is to provide a historical overview and explanation of rises and developments of mass movements and totalitarian states in 20th century. The course is based on political and econom-social history with attention to philosophic and psychologic connections.			
AD0B16HT1	History of science and technology 1	KZ	4
This subject provides basic information on the development of science and technology in the world and at home from the earliest times to the present. The course is aimed primarily at explaining the significance of key levels of technology development, industrial revolutions and their impact on society.			
AD0B16MPS	Psychology	Z,ZK	4
AD0B17BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination. Bachelor, s projects are oriented into microwave technique, antennas, propagation, optoelectronics, EMC, medical applications.			
AD0B31BAP	Bachelor thesis	Z	20
AD0B32BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B33BAP	Bachelor thesis	Z	20
AD0B34BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B34PPN	Principles and Rules of Electronic Design.	Z,ZK	4
Introduction to principles of electronic design. Reliability, compatibility, testability, safety. General design rules for professional electronic design with superior ratings in terms of high frequency and high current, immunity to a disturbance, low-level electromagnetic emission, etc. Miniaturization and cost minimization. Education of electronic design methodology in favour of creativity instead of specialization on specific devices and systems. Hands-on approach with aid of modern computer design tools.			
AD0B35BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B35SPS	Computer System Structures	Z,ZK	6
The subject introduces into basic hardware structures of computer systems, into their design and architecture. It explains technical background of classic computer systems and special computer for digital and logic control. It gives greater insight into parallel processing of data in computers. Students obtain credits from practical exercises according to results of individual projects. The projects are solved on FPGA development boards Altera DE2 that are utilized in similar courses by many world's top universities.			
AD0B36APO	Computer Architectures	Z,ZK	6
Subject provides overview of basic building blocks of computer systems. Explanation starts from hardware side where it extends knowledge presented in the previous lectures of Structures of computer systems. Topics cover building blocks description, CPU structure, multiple processors interconnections, input/output subsystem and basic overview of network and buses topologies. Emphasis is placed on clarification of interconnection of hardware components with software support, mainly lower levels of operating systems, device drivers and virtualization techniques. General principles are more elaborated during presentation of examples of multiple standard CPU architectures. Exercises are more focused on the software view to the contrary. Students are lead from basic programming on CPU level to the interaction with raw hardware.			
AD0B36BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study program. Student will choose a topic from a range of topics related to his or her branch of study that will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B36PRI	Programming	Z,ZK	5
The course is an introduction into basics programming using using the Java language. Its core are data types, expressions, functions (exemplified by those at Java programming language), algorithms complexity evaluation, basics of programming techniques. In a comparative way the basic properties of language C are presented.			
AD0B37BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B38BAP	Bachelor thesis	Z	20
Independent final project for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The Bachelor's project will be defended in front of the board of examiners for the comprehensive final examination.			
AD0B39BAP	Bachelor thesis	Z	20
AD1B01MA2	Multidimensional Analysis	Z,ZK	6
The aim of the course is to introduce students to basics of differential and integral calculus of functions of more variables and to basics of series of numbers and functions.			
AD1B13PPS	Industrial computer systems	Z,ZK	5
The subject is focused on basic knowledges about computer control systems used in electrotechnic engineering and energetics. Students works with hardware for data acquisition and data processing, software tools and application examples. There are presented elementary digital circuits, the representation of numbers and their processing in microcomputer and fundamental block of microprocessor and microcomputer. The single chip microcomputer, embedded application, industrial PC and design to industrial condition are presented.			
AD1B13SVS	Solar Energy Application Systems	Z,ZK	5
Solar energy. Photovoltaic phenomena. Photovoltaic cells and modules and their characteristics. Photovoltaic systems and their applications. Photo-thermal phenomena. Photo-thermal power stations. Significance, economic and environmental aspects of solar energy exploitation.			
AD1B14MIS	Microprocessors for Power Systems	Z,ZK	5
Power electronics control computer structure, digital signal processor and ALU added features for fast real time calculations. Interrupt system and DMA system, analog signal measurement, fast impulse signal measurement, fast impulse generation support, inter-computer communication, system and power management, programming languages for power systems software development, programming techniques, software development tools (simulators, emulators, monitors), input signal conditioning circuitry, conversion from analog signals to digital processing, time sampling, amplitude quatization, power electronics control block design and implementation, difference equations and control algorithms, fixed and floating point calculations, debugging methods, program parametrization, guides and rules for implementation and application of power system control computers. Real time operating system, scheduler, dispatcher and another features and guides for application			

AD1B14PO1	Electric Drives and Traction 1	Z,ZK	6
Application of motion equation in drives, the motor torque, the load torque, the dynamical torque. Operating modes, electromechanical transient effects. Drives with DC motors, induction motors, synchronous motors, SRM, EC motors, linear motors. For each type its properties, speed control strategy and block scheme of a controller, range of application. Drive control computer structure, shared resources organization, special hardware blocks for signal measurement and signal generation in drives, programming techniques and languages for software development and debugging, migration from analog signal processing to the digital signal processing, time sampling and amplitude quantization, aliasing, difference equations and digital control algorithms. Drive commissioning			
AD1B14SEM	Seminar on Electrical Engineering	Z	2
The course summarizes the knowledge and shows practical use of electric energy from its production to its consumption. On the seminars, there are the basic fields of activity and related applications of following departments shown: Production and distribution of electric energy on the Department of Electroenergetics K13115, electric drives and actuators on the department of Electric Drives and Traction K13114, and the technology of production materials and equipment on the Department of Electrotechnology K13113.			
AD1B14SP1	Electric Machinery and Apparatus 1	Z,ZK	6
Electric drive and its components. Electromechanical energy conversion. Rotational converters - DC machines, induction motors, synchronous generators and motors. Special electric machines, actuators. Static converters - transformers. There are presented operational principles, main constructional scheme and characteristics, applications. Switching theory. Interaction between turn-off switch and switched circuit. Basic theory and characteristic of electric arc. Transient recovery voltage. Switching overvoltage. Low voltage protection apparatuses			
AD1B14VE1	Power Electronics 1	Z,ZK	5
Power semiconductor devices, their serial and parallel connection, voltage and current dimensioning, point-to-point and bridge rectifiers, reversible rectifiers, control pulse generators, AC/AC and DC/DC converters, voltage source inverters, current source inverters, resonance inverters, frequency converters, matrix converters, principles of electromagnetic compatibility, cooperation of power semiconductor converters with DC and AC motors, survey of power semiconductor converters application in engineering practice			
AD1B15EN1	Power Engineering 1	Z,ZK	5
The subject provides basic knowledge about the CR power system structure and operational characteristics and electrical power systems. Then it informs about the electric strength of insulators, machines and other power system devices. It presents knowledge about damaging phenomena of insulation systems and procedures for their elimination. It enables to meet insulation systems testing and diagnostics problems.			
AD1B15EN2	Power Engineering 2	Z,ZK	6
The subject is focused on the task of electrical energy transmission and distribution. It introduces particular components of electrical systems and their electrical parameters. It explains steady and failure states in ES and other transient events. It explains principles of electrical devices protections, dimensioning principles and electrical stations realization in the transmission and distribution system.			
AD1B15EN3	Power Engineering 3	Z,ZK	5
The aim of the course is to become students acquainted with heat transfer laws, the design and use of resistive, dielectric, induction and arc electro-heat devices, thermal comfort of human being, heating of interiors and examples of particular problems of electro-heat devices design and calculations. The next part of the course acquaints students with basics of photometry, light measurement, light sources, luminaires and fundamentals of indoor and outdoor lighting.			
AD1B15MAA	Mathematic Applications	Z,ZK	6
The aim of the course is to obtain knowledge about mathematic programs used in power engineering. Student becomes acquainted with technical methods for gathering and data analysis, SW and HW hierarchy of resources and applications examples. Student will acquire basic knowledge about MATLAB, MATHEMATICA and mathematical model assessment. Student becomes also acquainted with the fields of complex variable function and numerical methods for solving algebraic and differential equations.			
AD1B17EMP	Electromagnetic Field	Z,ZK	5
This course gets its students acquainted with principles and applied electromagnetic field theory basics.			
AD1B31EOS	Electrical circuits	Z,ZK	6
The subject describes fundamental methods of electrical circuit analysis. The aim is to unify different level of knowledge of students coming from schools of different categories and form the basis of knowledge necessary for next subjects. It presents the difference among physical circuit and its models, and then it presents the behavior of basic ideal circuit elements in DC circuits and in sinusoidal steady state as well as transients, caused by changes in the circuit. Finally, it presents the brief description of more sophisticated methods of analysis (Laplace transform, pulse excitation ?).			
AD1B38EMA	Electrical Measurements	KZ	5
AD2B13PEL	Industrial Electrical Engineering	Z,ZK	5
A student will, at first, meet with information about basic types of materials for electrical engineering, their properties, technologies and applications. The next task is focused on the fundamentals, function and service characteristics of transformers, power electronic converters, generators, DC and AC motors and contact electric apparatus. The problems are tested on the mains supply real units. The third part of the course deals with power electrical engineering, with the basic characteristic of a power system in the Czech Rep. and with types, operational modes and environmental impact of different types of power sources.			
AD2B14BP1	Safety in Electrical Engineering 1	Z	0
The purpose of the course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it. In this way the students receive qualification of instructed person that enables them to work on electrical equipment according to the Directive of the Dean No. 1/2007			
AD2B14BPZS	Basic health and occupational safety regulations	Z	0
The guidelines were worked out based on The Training Scheme for Health and Occupational Safety designed for employees and students of the Czech Technical University in Prague, which was provided by the Rector's Office of the CTU. Safety is considered one of the basic duties of all employees and students. The knowledge of Health and Occupational Safety regulations forms an integral and permanent part of qualification requirements. Directive of the Dean No. 1/2007. This program is obligatory.			
AD2B17EPV	Electromagnetic Field, Waves and Lines	Z,ZK	5
This course presents fundamentals of electromagnetic field theory and its applications. Analysis methods proper for static, stationary as well as dynamic fields and waves in free space and on basic transmission lines are presented as well. This course provides students with physics - based view on studied effects, which is applied then on engineering problems. At the end of the course, all effects should not only be described, but quantified as well. Basic knowledge and insight into communication devices, systems and techniques is provided, applicable not only to systems currently taught in other courses, but to future systems as well.			
AD2B17IN1	Individual Project	KZ	3
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject. Projects deals with microwave technique, antennas, propagation, optical communications, EMC, and medical applications.			
AD2B17IN2	Individual Project	KZ	3
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject. Projects deals with microwave technique, antennas, propagation, optical communications, EMC, and medical applications.			
AD2B17PMS	Fixed and Mobile Wireless Links	Z,ZK	6
The goal of the course is to provide basic knowledge of the wireless transmission in real environments for specific applications, namely for the needs of the planning of wireless radio links. The key topics include: the wireless transmission, the link budget for various types of radio links, antenna parameters, basic types and applications of antennas, propagation of			

radio waves in the atmosphere for specific frequency bands and telecommunication services, propagation models for planning of fixed and mobile links for both terrestrial and satellite services, the interference and frequency planning, basics of cellular networks, ITU-R recommendations.			
AD2B31ANO	Analog Circuits	Z,ZK	5
The course is designed to acquaint students with the basics of analog electronic circuits. The first part is devoted to fundamental transistor amplifiers and elemental structures of analog integrated circuits. Then the typical applications of operational amplifiers are introduced, including non-linear networks and basic frequency filter design and implementation. Problems of oscillators are discussed at the conclusion.			
AD2B31IN1	Project I.	KZ	3
AD2B31IN2	Project II.	KZ	3
AD2B31ZEO	Fundamentals of Electrical Circuits	Z,ZK	5
The subject describes fundamental methods of electrical circuit analysis. After a brief introductory part where the difference between an electrical device and its models is introduced, the basic ideal passive and active circuit elements are then defined. Next, basic circuit quantities are defined; lectures are then focused on important laws and methods of analysis of electrical circuits. Circuit theorems, an analysis of DC circuits, AC circuits, first-order and second-order circuits are described. Finally, a brief description of more sophisticated methods of analysis (Laplace transform, pulse excitation) is done. The seminars are focused on getting a theoretical experience in analysis of electrical circuits, supplemented with simulations and simple measurement.			
AD2B32DAT	Data networks	Z,ZK	5
The course introduces students to the basics of communication in a variety of data networks. The aim of the course is to provide a more comprehensive view of communication protocol for specific types most commonly used data networks according to the RM-layer OSI model. The course also allows students to look into ways of communicating with TCP/IP in the Internet, including the possibility of a practical realization of the data network in laboratory conditions using real equipment.			
AD2B32IND	Individual Project	KZ	3
Independent final work for the Bachelor's degree study programme. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments.			
AD2B32TPR	Team Project	KZ	3
Teamwork in the form of project. The theme of work, the student selects from a menu of topics related to the specialization studied. Choice of theme, the student becomes a member of the team. Its task is to participate in collaboration with colleagues to solve the task.			
AD2B34ELP	Electron Devices	Z,ZK	5
This course introduces the basic theory, principles of operation and properties of electron devices. Physical principles of operation, device structures and characteristics are explained together with adequate models for small- and large-signal. Basic applications in analogue and digital electronics are examined. In seminars and labs, students are introduced to basic principles of device simulation, measurement of device characteristics and extraction of device parameters. Operation of electron devices in electronic devices is then analyzed using the PSpice simulator.			
AD2B34IN1	Individual project	KZ	3
Independent work in the form of a project. A student will choose a topic related to his or her branch of study, which will be specified department or branch departments. The project will be defended within the framework of a subject.			
AD2B34IN2	Individual project	KZ	3
Independent work in the form of a project. A student will choose a topic related to his or her branch of study, which will be specified department or branch departments. The project will be defended within the framework of a subject.			
AD2B34SEI	Sensors in Electronics and Informatics	Z,ZK	6
The subject describes basic physical, electronic as well as optoelectronic behaviours using in sensors and microsensors, static and dynamic parameters, improvement of parameters, sensor data processing, intelligent sensors, applications of basic principles in sensors (temperature, pressure, optoelectronic and fibre optic, radiation, chemical, mechanical, level, flow, ultrasound, etc.). There are showed principles and applications of MEMS and microsystems in the subject. Principles are demonstrated on actual sensor datasheets and applications.			
AD2B37IN1	Individual Project I	KZ	3
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.			
AD2B37IN2	Individual Project II	KZ	3
Independent work in the form of a project. A student will choose a topic from a range of topics related to his or her branch of study, which will be specified by branch department or branch departments. The project will be defended within the framework of a subject.			
AD2B37MMT	Multimedia Technology	Z,ZK	6
This course is the introduction to multimedia technology (audio and video). It overviews sound and picture acquisition, signal processing, transmission and distribution, recording and reproduction including physiology of hearing and vision. It provides fundamental information for understanding the main principles for system solutions in the field.			
AD2B38EMB	Electrical Measurements and Instrumentation	Z,ZK	5
Methods of measurement of electrical physical quantities (voltage, current, power, frequency, resistance, capacitance and inductance) are explained together with principles of their correct application and accuracy estimation. The course is closed by presenting information of several basic electronic measuring instruments and explaining fundamentals of magnetic measurements and basic information concerning measurement systems.			
AD2B99DIT	Digital Engineering	Z,ZK	5
The goal of this course is to provide the introduction into designing and realization of digital circuits. First, necessary mathematical apparatus, such as the Boolean algebra, Karnaugh maps, minimization and realization of logical functions is presented, followed by brief introduction into basics of logical circuits, such as the logical gates, flip-flops, TTL and CMOS logic etc. The second part is dedicated mainly to modern designing techniques of digital circuits using programmable FPGA and VHDL language. During these lessons, the basics of VHDL together with numerous examples are evaluated to provide a complex insight into this hardware description language and modern methods of designing and realization of digital circuits.			
AD2B99KAM	Communication and Multimedia	Z	5
The subject is focused on an introduction of 1st term students (Bc. study) to the field of communication and multimedia technology and electronics. This field is very broad and offers to students multidisciplinary (interdisciplinary) education. At the beginning of study it is important to inform students about different parts. The task is to do it in popular and acceptable form and show the most important parts of this very broad industrial and research branch. The area is covered by five departments providing educational and research inputs. This interdisciplinary subject demonstrates as an introduction to study expected job opportunities in IT, assistive, biomedical and other technologies.			
AD2B99KOS	Communication Systems	Z,ZK	6
The course gives an overview of the basic principles and methods used in digital communications in a variety of transmission environments (radio systems, metallic telecommunication lines, optical fiber). The students will learn the basic functional blocks of the communication systems, encoding and decoding, modulation and demodulation methods. The students obtain the idea about sources of errors in the transmission and ways for their detection and correction. They will learn how to calculate the theoretical and practical communication channel capacity, the basic parameters on digital interfaces measurement, including error rate and jitter.			
AD2B99SAS	Signals and systems	Z,ZK	5
Course explains basic terms and methods for continuous-time and discrete-time signal and system analysis.			

AD3B01MA2	Mathematics 2	Z,ZK	7
The subject covers an introduction to the differential and integral calculus in several variables and basic relations between curve and surface integrals. Other part contains function series and power series with application to Taylor and Fourier series.			
AD3B14EPR	Electric drive for automation and robotics	Z,ZK	6
Principle, philosophy and characteristics sources seat power control energy, changers for power supply small el. drive. Industrial automat used for drive el. drive. Small machinery and special electrical machine used in automatization and robots. Proposal electrical drive for automation application. Practical exhibits and check feature el. drive			
AD3B31EOP	Electrical Circuits and Elements	Z,ZK	8
The Subject deals with basic and most important principles of the electrical circuit analysis. It defines basic circuit variables and elements, and real components of actual electrical equipments. Subject deals with basic methods of the circuit analysis. It is oriented on basic thematic units of the analogue and digital technics that are necessary for the cybernetics and control technique study.			
AD3B31TES	Signal theory	Z,ZK	5
Course explains basic terms and methods for continuous-time and discrete-time signal and system analysis.			
AD3B33DRR	Dynamics and control of robots	Z,ZK	6
The subject undrestands the robot as a dynamical system. Its design, identification, control and programming will be introduced. The methods can be used for other electromechanic systems, e.g., production machines and manipulation devices.			
AD3B33KUI	Cybernetics and Artificial Intelligence	Z,ZK	5
The course will enable students to understand the basic concepts, goals and methods of cybernetics and artificial intelligence, and align some individual topics studied in the bachelor stage into the more profound context of the study program. The syllabus contains topics concerned with general aspects of systems and information theory, problem solving and state space search principles, elements of game theory, knowledge and expert systems, elements of decision theory, recognition and machine learning. The most important feature of the course is its unifying conceptual approach to many, at first sight diverse, components of cybernetics and artificial intelligence.			
AD3B33OSD	Operating Systems and Databases	Z,ZK	6
The goal of this course is to introduce basic concepts and principles of operating systems (OS), like processes and threads, their scheduling, mutual communication and synchronization, time-dependent errors and deadlocks. Attention is also paid to memory management, virtual memory, management of secondary storages, file-systems and data security. The second part of the course is focused at databases, their types and structures, concurrent data access and transactions.			
AD3B33ROB	Robotics	Z,ZK	6
Robotics is an integrating discipline designing and exploring machines with high degree of flexibility and autonomy. The subject introduces the discipline. It will briefly present broader context of robotics first and after that will teach students kinematics and statics of robots.			
AD3B35APE	Applied electronics	Z,ZK	6
The main goal of this subject is acquirement of the knowledge for design of the real electronics equipments especially in area of the control systems and robotic. In comparison with analogical specialized theoretical subjects emphasis is placed on the practical application. Here the design of the schematic, choice of the suitable components, design of the printed circuit board and mechanical aspects will be explained.			
AD3B35ARI	Automatic Control	Z,ZK	7
Foundation course of automatic control. Introduction to basic concepts and properties of dynamic systems of physical, engineering, biological, economics, robotics and informatics nature. Basic principles of feedback and its use as a tool for altering the behavior of systems and managing uncertainty. Classical and modern methods for analysis and design of automatic control systems. Students specialized in systems and control will build on these ideas and knowledge in the advanced courses to follow. Students of other branches and programs will find out that control is a inspiring, ubiquitous and entertaining field worth of a future cooperation.			
AD3B35MSD	Modeling and simulation of dynamic systems	Z,ZK	6
The goal of the course is to teach you how to build control-oriented mathematical models of complex dynamic systems. The focus will be on modeling techniques that can glue together subsystems from diverse physical domains. We will show that the concept of energy (or power), which is universally valid across physical domains, is the right tool for combining electrical, mechanical, hydraulic, pneumatic, thermal and thermodynamic systems. Some of the methods presented in this course will be at least partially useful in the domains where the concept of energy is not so useful such as socio-economic systems. In total we will introduce three groups of modeling techniques, which are based on the concept of energy. Analytical methods based on the Lagrangean and Hamiltonian functions well known from the studies in theoretical physics and/or mechanics, object-oriented modeling as an alternative to the more widespread block-oriented modeling, and last but not least an intuitive graphical techniques known as bond graph modeling. Whichever methodology is followed to create the mathematical model, of of the ways to analyze it is a numerical simulation, that is, numerical solution of the corresponding differential or differential-algebraic equations. In this course we will be exposed to the basics of numerical techniques for differential and differential-algebraic equations with the objective to understand the basic issues such as approximation errors, numerical stability and suitability of the common methods for different classes of models.			
AD3B38MMP	Microprocessors and Microcontrollers in Instrumentation	Z,ZK	6
Applications of microprocessors and single chip microcontrollers in instrumentation techniques are presented in this course. The course is focused on describing function and programming in embedded applications.			
AD3B38PRT	Instrumentation for Data Acqisition and Proces Control	Z,ZK	6
An automation of production, quality control or research and development are based on the use of data acquisition systems. Different types of standardized systems, their parameters, programming, and applications are described here. Laboratories are pointing to the programming of frequently used systems using different developing tools. Survey of the evaluation of teaching at FEE: http://www.fel.cvut.cz/anketa/aktualni/courses/AE3B38PRT			
AD3B38SME	Sensors and Measurement	Z,ZK	6
Basic circuits and instruments for measurement of electrical quantities, AD and DA converters, sensors focused to use in robotics and automation, intelligent sensors, methods of decreasing uncertainties.			
AD3B99RO	Robots	KZ	5
AD4B01DMA	Discrete mathematics	Z,ZK	7
In this course students meet some important topics from the field of discrete mathematics. Namely, they will explore divisibility and calculations modulo n, diophantine equations, binary relations, induction, cardinality of sets, and recurrence equations. The second aim of this course is to teach students the language of mathematics, both passively and actively, and introduce them to mathematics as science.			
AD4B01MA2	Calculus	Z,ZK	8
This is an introductory course to calculus. In the first part we study limits, continuity and derivative of real functions of one variable. Then we define the indefinite integral, discuss basic integration methods, the definite integral and its applications. We extend the discussion to real functions of more variables, partial derivatives and multiple integrals. We conclude with the study of real numerical series.			
AD4B17EAM	Electromagnetism	Z,ZK	6
Based on theoretical fundamentals such as Maxwell equations, students will acquire insight into electromagnetic effects and ability to solve simple electromagnetic problems. Physical principles are applied to derive basics of circuit theory. Simple linear circuits, lumped as well as distributed, are described and analysed. Field theory application enables to understand basic circuit elements, such as resistors, capacitors, inductors, and transmission lines as well as important effects such as resonance and impedance matching. Exact quantitative description (analysis and/or design) of simple geometries helps to estimate fields and behaviour of more complex ones. Frequency domain and time domain formulations are combined to provide better insight. The course is completed by information on electromagnetic compatibility.			

AD4B32PKS	Computer and Communication Networks	Z,ZK	6
The aim of the course is to familiarize students with current trends in the switched local networks and the key functions of routing protocols in IP networks. The second part of the course introduces students to concepts of ensuring the information security in the communication networks. An integral part of the course is also an explanation of the principles for ensuring the adequate quality of services in data networks and features of some file sharing application protocols. The course is aimed rather primarily practically than theoretically			
AD4B33DS	Database Systems	Z,ZK	6
Database Systems and their architecture, query languages, transactions, object-relational mapping			
AD4B33FLP	Functional and Logic Programming	Z,ZK	6
This course introduces students into the techniques of functional programming in the LISP (or more precisely SCHEME) and HASKELL language and logic programming in the PROLOG language. Both languages are declarative in that the programmer symbolically describes the problem to be solved, rather than enumerating the exact sequence of actions to be taken. In PROLOG, one describes the problem by specifying properties of objects and relations thereamong through logic formulas. In LISP, the problem description takes the form of function definitions. Both languages have found significant applications in artificial intelligence fields, such as agent systems or symbolic machine learning.			
AD4B33OPT	Optimization	Z,ZK	7
The course provides the basics of mathematical optimization: using linear algebra for optimization (least squares, SVD), Lagrange multipliers, selected numerical algorithms (gradient, Newton, Gauss-Newton, Levenberg-Marquardt methods), linear programming, convex sets and functions, intro to convex optimization, duality.			
AD4B33OSS	Operating systems and networks	Z,ZK	6
The goal of this course is to introduce basic concepts and principles of operating systems (OS), like processes and threads, their scheduling, mutual communication and synchronization, time-dependent errors and deadlocks. Attention is also paid to memory management, virtual memory, management of secondary storages, file-systems and data security. The second part of the course is focused at distributed systems (DS) principles and technologies. DS communication media and topologies are explained and the basics of Internet including specific protocols are treated as typical DS applications.			
AD4B33RPZ	Pattern Recognition and Machine Learning	Z,ZK	6
The basic formulations of the statistical decision problem are presented. The necessary knowledge about the (statistical) relationship between observations and classes of objects is acquired by learning on the raining set. The course covers both well-established and advanced classifier learning methods, as Perceptron, AdaBoost, Support Vector Machines, and Neural Nets.			
AD4B33SI	Software Engineering	Z,ZK	6
The aim of this course is to provide the basic orientation in the software development process in order to be able to act effectively as a developmnet team members. The students will become knowledgeable in the core techniques of software design, support tools for the software development and selected project management and risk control procedures.			
AD4B33ZUI	Introduction to Artificial Intelligence	Z,ZK	6
This course provides introduction to symbolic artificial intelligence. It presents the algorithms for informed and non-informed state space search, nontraditional methods of problem solving, knowledge representation by means of formal logic, methods of automated reasoning and introduction to markovian decision making.			
AD4B34EM	Electronics and Microelectronics	Z,ZK	6
Semiconductors fundamentals, PN junction. Bipolar transistor, MOSFET structure. Fundamentals of Integrated systems processing technologies. CMOS technology, layout design, design rules. Analogue CMOS integrated circuits blocks, AD and DA convertors. Memory structures. Micro-electro-mechanical systems. Optoelectronics devices.			
AD4B35PSR	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.			
AD4B38DSP	Distributed Systems and Computer Networks	Z,ZK	6
Subject is devoted to principles and technologies of distributed systems (DS) and to their employment in typical applications. Physical layer media, analog and digital modulations, DS topologies, MAC methods, coding and cryptography basics are introduced. Widely used standard systems are then presented together with their features. Internet protocols are explained and internetworking approaches presented. Finally the typical industrial applications of distributed systems are introduced.			
AD4B38NVS	Embedded Systems Design	Z,ZK	6
The main aim of this subject is design of embeded systems using microcontrollers. It is mainly focused on 32-bit (alter. 8-bit) microcontrollers and DSP, supporting logic devices, external input/output devices and the other supporting devices.			
AD4B39TUR	Testing of user Interfaces	Z,ZK	6
Students will be acquainted with fundamental principles of testing of user interfaces. The lectures will cover the most important topics in this particular field in necessary extent. This extent will allow the students to test user interfaces in a given context that is defined, besides other aspects, by life cycle of software products. Important part of the course are issues dealing with user interfaces for special classes of user interfaces (handicapped users, user interfaces for mobile devices etc.). In the framework of seminars and labs the students will go through the whole design cycle beginning with the design of a particular user interface and ending up with its testing and subsequent evaluation. The testing will be done in usability lab that is at disposal in the department. [an-a4,ad4,ae4]			
AD4B77ASS	Architectures of Software Systems	Z,ZK	6
The objective of the course is to introduce the basic techniques of information system design and architecture. We will emphasize the use of standard design patterns in the distributed environments and concentrate on the general aspects of software systems, rather than on specific technologies or implementations.			
AD4B99SVP	Software or Research Project	KZ	6
AD7B36TS1	Introduction to Software Testing	KZ	5
TV-V1	Physical education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0

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

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