

Recommended pass through the study plan

Name of the pass: Branch Systems and Control - Passage through study

Faculty/Institute/Others: Faculty of Electrical Engineering

Department: Department of Control Engineering

Pass through the study plan: Cybernetics and Robotics - Systems and Control

Branch of study guaranteed by the department: Systems and Control

Guarantor of the study branch: prof. Ing. Michael Šebek, DrSc.

Program of study: Cybernetics and Robotics

Type of study: Bachelor full-time

Note on the pass:

Coding of roles of courses and groups of courses:

P - compulsory courses of the program, PO - compulsory courses of the branch, Z - compulsory courses, S - compulsory elective courses, PV - compulsory elective courses, F - elective specialized courses, V - elective courses, T - physical training courses

Coding of ways of completion of courses (KZ/Z/ZK) and coding of semesters (Z/L):

KZ - graded assesment, Z - assesment, ZK - examination, L - summer semester, Z - winter semester

Number of semester: 1

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
AE3B14BPZS	Basic health and occupational safety regulations	Z	0	2+2j	Z	P
AE0B01LAG	Linear Algebra	Z,ZK	7	4+2	Z	P
AE3B01MA1	Mathematics 1	Z,ZK	8	4+2	Z	P
AE0B36PR1	Programming 1 <i>Božena Mannová Božena Mannová Božena Mannová (Gar.)</i>	Z,ZK	6	2P+2C	Z	P
AE3B99RO	Robots	KZ	5	1P+3L	Z	P
AE3B14BP1	Safety in Electrical Engineering 1	Z	0	4+8j	Z	P
BKYREH	Humanities subjects <i>AE0B16ET1,AE0B16HI1,..... (see the list of groups below)</i>	Min. cours. 1	Min/Max 4/26			V

Number of semester: 2

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
AE0B01LGR	Logic and Graph Theory	Z,ZK	6	3+2	L	P
AE3B01MA2	Mathematics 2	Z,ZK	7	4+2	L	P
AE3B02FY1	Physics 1 for KyR	Z,ZK	6	4+2L	L	P
AE0B36PR2	Programming 2 <i>Božena Mannová, Ivan Jelínek Ivan Jelínek (Gar.)</i>	Z,ZK	6	2P+2C	L	P
AE3B31TES	Signal theory	Z,ZK	5	3+2c	L	P

Number of semester: 3

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
AE0B16EPD	Business economics <i>Tomáš Podivínský Tomáš Podivínský Tomáš Podivínský (Gar.)</i>	KZ	4	2+2s	Z,L	P
AE0B35SPS	Computer System Structures	Z,ZK	6	3P+2L	Z	P
AE3B31EOP	Elektrical Circuits and Elements	Z,ZK	8	4P+2C	Z	P
AE3B02FY2	Physics 2 for KyR	Z,ZK	5	3+2L	Z	P
AE0B01PSI	Probability, Statistics, and Theory of Information	Z,ZK	6	4+2	Z	P

Number of semester: 4

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
AE3B35ARI	Automatic Control	Z,ZK	7	4P+2L	L	P
AE3B33KUI	Cybernetics and Artificial Intelligence	Z,ZK	5	2P+2C	L	P
AE3B33OSD	Operating Systems and Databases	Z,ZK	6	3P+2C	L	P
AE3B38SME	Sensors and Measurement	Z,ZK	6	3P+2L	L	P
AE0B36APO	Computer Architectures	Z,ZK	6	2P+2L	L	PO

Number of semester: 5

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
AE3B38DSY	Distributed Systems and Computer Networks	Z,ZK	7	4P+2L	Z	P
AE0B16PRS	Presentation skills Craig Alan Morgan Jaroslav Knápek (Gar.)	Z	2	2s	Z,L	P
AE3B35MSD	Modeling and Simulation of Dynamic Systems	Z,ZK	6	2P+2L	Z	P
BKYREPRO	Project AE3B35IND,AE3B38IND,..... (see the list of groups below)	Min. cours. 1 Max. cours. 1	Min/Max 7/7			P
BKYREVOLSUB	Elective special subjects AE0B13PTE,AE0B38LPT,..... (see the list of groups below)	Min. cours. 0	Min/Max 0/999			V

Number of semester: 6

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
ABAP20	Bachelor thesis	Z	20	28s	L,Z	P
AE3B35APE	Applied Electronics	Z,ZK	6	2P+2L	L	PO
BKYREVOLSUB	Elective special subjects AE0B13PTE,AE0B38LPT,..... (see the list of groups below)	Min. cours. 0	Min/Max 0/999			V

List of groups of courses of this pass with the complete content of members of individual groups

Kód	Name of the group of courses and codes of members of this group (for specification see here or below the list of courses)	Completion	Credits	Scope	Semester	Role
BKYREH	Humanities subjects	Min. cours. 1	Min/Max 4/26			V
AE0B16ET1	Ethic	AE0B16HI1	History I	AE0B16HT1	History of science and technolog ...	
AE0B16HTE	History of technology and econom ...	AE0B16F11	Philosophy I	AE0B16MPS	Psychology	
A003TV	Physical Education					
BKYREPRO	Project	Min. cours. 1 Max. cours. 1	Min/Max 7/7			P
AE3B35IND	Individual Project	AE3B38IND	Individual Project	AE3B33IND	Individual project	
BKYREVOLSUB	Elective special subjects	Min. cours. 0	Min/Max 0/999			V
AE0B13PTE	Advanced technology in electrica ...	AE0B38LPT	Aircraft Instrumentation	AE2B31ANO	Analog Circuits	
AE4B77ASS	Architectures of Software System ...	AE0B14AEE	Automotive Electrical and Electr ...	AE0B31ZZS	Basic Signal Processing	
AE1B16EKP	Business Economics	AE1B16PAP	Business Law	AE0B38OCP	Circuits of Digital Instruments	
AE2B99KOS	Diagnostics and Measurement in T ...	AE1B37KEL	Communication and Electronics	AE2B37KMM	Communication and Measurement in ...	

AE2B99KAM	Communication and Multimedia	AE4B32PKS	Computer and Communication Netwo ...	AE0B13KEO	Construction of Electronic Circu ...
AE2B32DAT	Data networks	AE4B33DS	Database Systems	AE2B99DIT	Digital Engineering
AE4B01DMA	Discrete mathematics	AE4B38DSP	Distributed Systems and Computer ...	AE0B14SPP	Drive Sensors
AE0B13EKE	Ekologie pro elektrotechniky	AE1B14PO1	Electric Drives and Traction 1	AE1B14SP1	Electric Machinery and Apparatus ...
AE0B15EIN	Electrical Installations	AE1B38EMA	Electrical Measurements and Inst ...	AE2B38EMB	Electrical Measurements and Inst ...
AE1B31EOS	Electrical circuits	AE1B17EMP	Electromagnetic Field	AE2B17EPV	Electromagnetic Field, Waves and ...
AE4B17EAM	Electromagnetism	AE2B34ELP	Electron Devices	AE0B13ETM	Electrotechnical materials
AE4B38NVS	Embedded Systems Design	AE0B14TME	Engineering mechanics	AE0B38APH	FPGA Applications
AE2B17PMS	Fixed and Mobile Wireless Links	AE4B33FLP	Functional and Logic Programming	AE2B31ZEO	Fundamentals of Electrical Circu ...
AE2B31HPM	Hardware for Multimedia	AE2B17VMT	High Frequency and Microwave Tec ...	AE0B15VNZ	High-voltage Testing
AE2B13PEL	Industrial Electrical Engineerin ...	AE1B13PPS	Industrial computer systems	AE4B33ZUI	Introduction to Artificial Intel ...
AE2B99LES	Laboratory of Electronic Systems	AE1B16MME	Macro and Microeconomics	AE0B13MTE	Materials and Technology for Ele ...
AE1B15MAA	Mathematic Applications	AE0B17MTB	Matlab	AE1B14MIS	Microprocessors for Power System ...
AE2B37MMT	Multimedia Technology	AE2B31SMS	Multimedia signal synthesis	AE0B13NNT	Nanotechnology
AE2B32SOS	Network Operating Systems	AE2B32PPS	Network Planning and Operation	AE4B01NUM	Numerical Analysis
AE4B33OSS	Operating Systems and Networks	AE2B17OKS	Optical Communication Systems	AE4B33OPT	Optimization
AE4B33RPZ	Pattern Recognition and Machine ...	AE1B02FY1	Physics 1 for EEM	AE2B02FY1	Physics 1 for KME
AE1B02FY2	Physics 2 for EEM	AE2B02FY2	Physics 2 for KME	AE4B02FYZ	Physics for Informatics
AE1B14VE1	Power Electronics 1	AE1B15EN1	Power Engineering 1	AE1B15EN2	Power Engineering 2
AE1B15EN3	Power Engineering 3	AE0B15PES	Power Systems Operation	AE2B37ZST	Principles of Studio Technology
AE0B36PRI	Programming	AE0B38PSM	Programming Data Acquisition Sys ...	AE1B16RIP	Project management
AE2B37ROZ	Radio Circuits and Devices	AE2B17VFM	Radiofrequency Measurement	AE4B35PSR	Real-Time Systems Programming
AE1B14SEM	Seminar on Electrical Engineerin ...	AE0B38SES	Sensor Networks	AE2B34SEI	Sensors in Electronics and Infor ...
AE2B99SAS	Signals and systems	AE4B33SI	Software Engineering	AE4B99SVP	Software or Research Project
AE1B13SVS	Solar Energy Application Systems	AE4B99RPH	Solving problems and other games	AE0B14TDO	Technical Documentation
AE2B32TSI	Telecommunication Systems and Ne ...	AE4B39TUR	Testing of user Interfaces	AE2B32PSS	Transmission Systems and Network ...
AE4B39WA1	Web Applications Development	AE0B13SPE	Welding and Soldering in Electro ...		

List of courses of this pass:

Code	Name of the course	Completion	Credits
A003TV	Physical Education	Z	2
ABAP20	Bachelor thesis	Z	20
AE0B01LAG	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.			
AE0B01LGR	Logic and Graph Theory	Z,ZK	6
AE0B01PSI	Probability, Statistics, and Theory of Information	Z,ZK	6
Basics of probability theory, mathematical statistics, information theory, and coding. Includes descriptions of probability, random variables and their distributions, characteristics and operations with random variables. Basics of mathematical statistics: Point and interval estimates, methods of parameters estimation and hypotheses testing, least squares method. Basic notions and results of the theory of Markov chains. Shannon entropy, mutual and conditional information.			
AE0B13EKE	Ekologie pro elektrotechniky	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.			
AE0B13ETM	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.			
AE0B13KEO	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.			
AE0B13MTE	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.			
AE0B13NNT	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.			
AE0B13PTE	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.			

AE0B13SPE	Welding and Soldering in Electrotechnics 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.	KZ	4
AE0B14AEE	Automotive Electrical and Electronic Engineering 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.	Z,ZK	4
AE0B14SPP	Drive Sensors 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	Z,ZK	4
AE0B14TDO	Technical Documentation 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	KZ	3
AE0B14TME	Engineering mechanics 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.	Z,ZK	4
AE0B15EIN	Electrical Installations 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.	Z,ZK	4
AE0B15PES	Power Systems Operation 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.	Z,ZK	5
AE0B15VNZ	High-voltage Testing 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.	Z,ZK	4
AE0B16EPD	Business economics Basic course of Business Economics deals with the subject from wide angle of view, discussing all particular aspects of Business Economics, and relationships between them.	KZ	4
AE0B16ET1	Ethic 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.	KZ	4
AE0B16FI1	Philosophy I 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.	KZ	4
AE0B16HI1	History I 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.	KZ	4
AE0B16HT1	History of science and technology 1 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.	KZ	4
AE0B16HTE	History of technology and economic The course introduces the scientific branch of the history of technology as the economic and social context of the Czech lands and Czechoslovakia in comparison with the development of the European region 19th to 21st century.	ZK	2
AE0B16MPS	Psychology	Z,ZK	4
AE0B16PRS	Presentation skills Students will learn to prepare and to do presentation. They will obtain skills how to prepare written documents using typographic principles and proper way of citation and referencing. They will prove gained theoretical knowledge on self prepared interactive presentation that is recorded on video and discussed.	Z	2
AE0B17MTB	Matlab Students will learn how to efficiently use both basic and advanced Matlab functions, including graphic user interface design. Emphasis will be put on problem analysis and implementation, understanding Matlab documentation, debugging user-defined functions and independent work with Matlab (proved by work on the project). Knowledge acquired can be applied to a broad spectra of courses taught at FEE (processing labs, final projects) and can be used in future professional career.	KZ	4
AE0B31ZZS	Basic Signal Processing The introductory subject to the study of Digital Signal Processing. The main emphasis is focused on the interpretation and acquirement of the basic principals. Practical approaches and real examples from different areas (music, biomedical engineering, speech processing communication systems) are used. The program system MATLAB is used for the tasks solution, which offers comfortable and user friendly environment with graphical and sound outputs and allows digital signal processing in different formats.	Z,ZK	4
AE0B35SPS	Computer System Structures 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.	Z,ZK	6
AE0B36APO	Computer Architectures 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.	Z,ZK	6
AE0B36PR1	Programming 1 The aim of the course is to teach the students: basic interactions with user interface and to program development system, introduction to JAVA, basic control flow structures and data structures, functions, arrays, object-oriented programming concepts, streams and files. The students are able to construct and debug a simple program in Java.	Z,ZK	6

AE0B36PR2	Programming 2	Z,ZK	6
The course moves along the understanding of programming skills from Programming 1, the aim is to design an interactive application with a graphic user interface (GUI), with knowledge of polymorphism abstract classes, interfaces, events handling, applets, user libraries, library practical application. Further students continue by the comparative way in getting acquainted in C language on the base of Java language, dynamic memory management, students are able to analyze the simple programs in C language.			
AE0B36PRI	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.			
AE0B38APH	FPGA Applications	KZ	5
AE0B38LPT	Aircraft Instrumentation	Z,ZK	5
The course deals with theory and description of function of aircraft's low frequency instruments and systems. Students test them and measure their parameters in laboratory courses.			
AE0B38OCP	Circuits of Digital Instruments	Z,ZK	5
Basic types of circuits and blocks of digital measuring instruments are described and analysed. Range and linearity for analogue circuits and interfaces for digital circuits are analysed in detail. Finally, individual projects including block design, model realisation and parameters verification are solved.			
AE0B38PSM	Programming Data Acquisition Systems	KZ	5
A subject deals with modern data acquisition systems (DAQ) being used in laboratory and industrial environment. Lectures are focused on detailed description of DAQ systems properties, software development and typical laboratory and industrial applications. Assigned software tasks in laboratories are solved using C/C++ language or LabVIEW environment.			
AE0B38SES	Sensor Networks	Z,ZK	5
The course introduces the fundamentals of sensor networks (primarily wireless sensor networks). Emphasis will be placed on distributed data processing in sensor networks and differences between sensor and computer networks. Laboratory exercises enable an implementation of small sensor network for real application in the frame of individual student project.			
AE1B02FY1	Physics 1 for EEM	ZK	2
Within the framework of this course the students gain the knowledge of selected parts of physics. The introductory part of the course deals with the classical mechanics, which involves the particle kinematics; dynamics of the mass particle, system of mass particles and rigid bodies. The students should be able to solve basic problems dealing with the description of mechanical systems, which they can meet during the studies of other disciplines. Apart of this, the knowledge gained in this course is required for the study of the consecutive course Physics 2.			
AE1B02FY2	Physics 2 for EEM	Z,ZK	4
The course Physics 2 is closely linked with the course Physics 1. Within the framework of this course the students will first of all learn foundations of thermodynamics. Following topic - the theory of waves - will give to the students basic insight into the properties of waves and will help to the students to understand that the presented description of the waves has a universal character in spite of the waves character. Particular types of waves, such as acoustic or optical waves are the subjects of the following section. The knowledge gained in this course will help to students in the study of such modern disciplines as measuring technique, propagation of electromagnetic waves, electroacoustic or optical communications and will allow them to understand the principles of novel technologies and functioning of new electronic devices.			
AE1B13PPS	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.			
AE1B13SVS	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.			
AE1B14MIS	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			
AE1B14PO1	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			
AE1B14SEM	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.			
AE1B14SP1	Electric Machinery and Apparatus 1	Z,ZK	5
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			
AE1B14VE1	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			
AE1B15EN1	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.			
AE1B15EN2	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.			

AE1B15EN3	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.			
AE1B15MAA	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.			
AE1B16EKP	Business Economics	Z,ZK	5
Targets and function of business, corporation life cycle. Cost classification, cost calculation, cost curves. Profit, production, price and cost relation. Taxes. Financial calculus and investment decision-making. Business plan. Management functions, corporation organizational schemes. Processes and firm management.			
AE1B16MME	Macro and Microeconomics	Z,ZK	5
Basic economic terms, market, law of demand, law of supply, market equilibrium, price regulation, price and income elasticities, consumer's behavior, producer's behavior, cost, revenue, profit, market failure, monopoly, government macroeconomic policy, gross domestic product, multipliers, money, inflation, banking system, monetary policy, labor market, business cycle, fiscal policy, foreign trade policy, comparative advantage, CR and EU, Euro.			
AE1B16PAP	Business Law	Z,ZK	5
Introduction to Legal Terminology. Legal Regulation of Business in the Czech Republic. Legal Regulation of Business in European Union and legally binding Regulation for business subjects in the Czech Republic. Basic legal Regulations concerning Business Activities. Introduction to Commercial Law, commercial law obligation relationships, business entities, co-operatives, public control. Introduction to Civil Law, civil law obligation relationships, personal entities and legal entities, analogy of law, public control. Introduction to Trade Law, rights and duties of businessmen, business trade operation, commencement and types of trade authorization, public control. Introduction to Labour Law, labour law relationships, types of contractual relationships, public control. Protection of the competition. Enforcement of Law and executive proceedings.			
AE1B16RIP	Project management	KZ	5
Bases of project management. Project Development Cycle. Project planning. Team project management. Information system of project management. Software support for planning and project management.			
AE1B17EMP	Electromagnetic Field	Z,ZK	5
This course gets its students acquainted with principles and applied electromagnetic field theory basics.			
AE1B31EOS	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 ?).			
AE1B37KEL	Communication and Electronics	KZ	4
The purpose of the subject is acquiring fundamental knowledge of related themes of communication and electronics. First, the students are introduced to fundamentals of communication, the most important analog and digital modulations, and basic conception of radio systems. Second, students give information about basic elements, connections, and function blocks of electronics. The last part of the subject is devoted to explication of fundamental circuits of radio engineering.			
AE1B38EMA	Electrical Measurements and Instrumentation	KZ	5
AE2B02FY1	Physics 1 for KME	Z,ZK	4
Within the framework of this course the students gain the knowledge of selected parts of physics. The introductory part of the course deals with the classical mechanics, which involves the particle kinematics; dynamics of the mass particle, system of mass particles and rigid bodies. The students should be able to solve basic problems dealing with the description of mechanical systems, which they can meet during the studies of other disciplines. Apart of this, the knowledge gained in this course is required for the study of the consecutive course Physics 2.			
AE2B02FY2	Physics 2 for KME	KZ	3
The course Physics 2 is closely linked with the course Physics 1. Within the framework of this course the students will first of all learn foundations of thermodynamics. Following topic - the theory of waves - will give to the students basic insight into the properties of waves and will help to the students to understand that the presented description of the waves has a universal character in spite of the waves character. Particular types of waves, such as acoustic or optical waves are the subjects of the following section. Relativistic mechanics, quantum mechanics and nuclear physics will complete the student's general education in physics. The knowledge gained in this course will help to students in the study of such modern disciplines as measuring technique, propagation of electromagnetic waves, electroacoustic or optical communications and will allow them to understand the principles of novel technologies and functioning of new electronic devices.			
AE2B13PEL	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.			
AE2B17EPV	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.			
AE2B17OKS	Optical Communication Systems	Z,ZK	6
The main aim of the subject is to introduce principals of the optical system theory. The subject includes theoretical background of optics, practical skills for design of optical systems with utilization of professional software. Moreover it incorporates electron optics, matrix optics, Gaussian beams, transition through optical components, absorption and dispersion, optical transmitter and receiver, detection, fundamental technology and measurement of optical waveguides.			
AE2B17PMS	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.			
AE2B17VFM	Radiofrequency Measurement	Z,ZK	6
The subject guides students to gain both theoretical and practical skills in radiofrequency and microwave measurements. It is focused on measurement methods and instruments applied e.g. in telecommunication, radio, radar, cable network, navigation, and other systems working in frequency band from units of MHz to 50GHz, thus from classical radio to microwave area. Students are informed about basic principles and construction of generators, synthesizers, frequency counters, vector generators, spectrum, signal, scalar and vector			

analyzers and their applications in various measurement methods. Theoretical knowledge from lectures are supplemented by practical measurements in laboratories equipped with modern instruments applied in current professional practice.			
AE2B17VMT	High Frequency and Microwave Technique	Z,ZK	6
Goal of the lectures is to explain to students basic principals of rf. and microwave circuits, both passive and active (e.g. attenuators, couplers, isolators and circulators, modulators, oscillators, mixers and amplifiers). In conclusion to subjects on theory of EM fields a topics of transmission lines and waveguides (e.g. microstrip line, coplanar line, circular, . H and dielectric waveguide) and resonators (a section of transmission line, cavity, open, dielectric) are described Further a circuit analysis based on scattering parameters is being explained. Basic applications of rf. and microwave circuits are being discussed.			
AE2B31ANO	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.			
AE2B31HPM	Hardware for Multimedia	Z,ZK	6
Subject provides concise basic overview of hardware used in multimedia (MM). It however does not try to achieve an encyclopedic completeness - instead of it, detailed analysis is carried out for selected blocks containing interesting technical solutions and more general principles. The main focus is specialization of digital function blocks for processing of MM data. Analog circuits are described manly as a complement to digital core. Frequent examples of MM data are used to illustrate functions of individual HW blocks.			
AE2B31SMS	Multimedia signal synthesis	Z,ZK	6
This course introduces the fundamentals of sound synthesis algorithms (everyday, music and speech), digital audio effects and sonification. Multimedia synthetic signals are used in modern digital systems, virtual reality systems, computer animations, games and film. Understanding of theoretical concepts will be consolidated through practical programming assignments in Matlab.			
AE2B31ZEO	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.			
AE2B32DAT	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.			
AE2B32PPS	Network Planning and Operation	Z,ZK	6
The subject expands knowledge obtained in precedent studies on such issues as network planning, network design, network constructions and network operation. The attention is further given to the legislation in telecommunications and to the business aspects of telecommunications.			
AE2B32PSS	Transmission Systems and Networks	Z,ZK	6
The communication systems are presented in wide area network context. The optical technology in backbone networks is dominant segment of the subject. The transmission and multiplexing of the digital signals are primary part of the subject, the reliability, distribution of clock, management, monitoring and design of the network are secondary part of the subject. The students can use theoretic knowledge in practice while working on the model project of transmission network.			
AE2B32SOS	Network Operating Systems	Z,ZK	6
Network operating systems, Linux, Unix. Administration and network tools, managing and administration of documentation. The graduates will be informed about basic conception and procedures in operating systems administration (UNIX) and gain the basic facility in operating systems configuration based on the x 86 platforms.			
AE2B32TSI	Telecommunication Systems and Networks	Z,ZK	6
The subject discusses principles of telecommunication systems - mainly digital transmission systems and digital switching systems. The subject will provide students with the overview of the entire telecommunication domain, so that they can solve particular problems related to network traffic. They will also obtain basic knowledge of technologies that are used in modern wired and wireless networks. Results of the survey (students' opinions) concerning the subject can be found here: https://www.fel.cvut.cz/cz/anketa/aktualni/courses/AE2B32TSI			
AE2B34ELP	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.			
AE2B34SEI	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.			
AE2B37KMM	Communication and Measurement in Multimedia	Z,ZK	6
The aim of the subject is to give basic overview of present and perspective communication systems, mainly in relation to signal transmission and measurement. Lectures and practices make students familiar with technical principles of systems, basic conception of transmitter and receiver and measurement of these systems. Subject is focused on multimedia systems; it means systems for voice, audio, video and generally data transmission. Practices are based on laboratory measurements.			
AE2B37MMT	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.			
AE2B37ROZ	Radio Circuits and Devices	Z,ZK	6
The goal of the subject is to inform the students about properties, parameters, and design methodology of radio circuits, radio function blocks, and more complex blocks of radio transmitters and receivers. The lectures are devoted sequentially to elements, circuits, function blocks, and systems which are used at radio frequencies. The exercises are both seminar and laboratory; the seminars are devoted the basic calculations from the area of the radio function blocks, and the measurements are devoted to both basic function blocks and more complex problems from the area of radio transmitters and receivers.			
AE2B37ZST	Principles of Studio Technology	Z,ZK	6
The course gives basic knowledge of elements and systems used in television and radio professional and semiprofessional studio technology and of technology of radio and television production and broadcasting. Laboratory exercises are situated in a small school studio and are completed with professional excursions.			
AE2B38EMB	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.			

AE2B99DIT	Digital Engineering	Z,ZK	5
In this course, students will learn design principles for combinational and sequential digital circuits, using TTL components as well as field programmable gate arrays. The functional design using standard mathematical description and VHDL will be used for designing and realization of various digital circuits. The laboratory classes will be arranged as a set of laboratory tasks and practical examples. Some laboratory lessons will be focused on VHDL and its application for realization of basic digital circuits using FPGAs, their simulations and emulations as well as creating more advanced digital blocks.			
AE2B99KAM	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.			
AE2B99KOS	Diagnostics and Measurement in Telecommunications	Z,ZK	6
The subject builds on knowledge of basic types of interfaces used in telecommunications (from classic, via a packet-oriented and expected future generation system). Explains the importance of key parameters, presents tools for the monitoring and measurement methodology and fault diagnosis. Students verify acquired knowledge to practical tasks in the laboratory to real systems and advanced measurement techniques.			
AE2B99LES	Laboratory of Electronic Systems	Z,ZK	6
The objective of the subject is to inform students about potential of electronic circuit simulations. The course is based on concrete applications. Themes of the first part of the lectures are put to a test on basic circuits. Specific circuit applications follow with a detailed explanation and a simulation in exercises afterwards. Selected circuits will be checked by laboratory measurements.			
AE2B99SAS	Signals and systems	Z,ZK	5
Course explains basic terms and methods for continuous-time and discrete-time signal and system analysis.			
AE3B01MA1	Mathematics 1	Z,ZK	8
The aim of the course is to introduce students to basics of differential and integral calculus of functions of one variable.			
AE3B01MA2	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.			
AE3B02FY1	Physics 1 for KyR	Z,ZK	6
The basic course of physics at the Faculty of Electrical Engineering - Physics 1, is devoted to the introduction into two important areas of physics. The first one is a classical mechanics and the second one is the electric and magnetic field. Within the framework of the classical mechanics, the students study the particle kinematics; dynamics of the mass particle, system of mass particles and rigid bodies. The students should be able to solve basic problems dealing with the description of mechanical systems, which they can meet during their further studies. The classical mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The students can use the facts gained in this course in the study of electrical circuits, theory of electrotechnical materials or radioelectronics. Apart of this, the knowledge gained in this course is required for the study of the consecutive course Physics 2.			
AE3B02FY2	Physics 2 for KyR	Z,ZK	5
The course Physics 2 is closely linked with the course Physics 1. Within the framework of this course the students will first of all learn foundations of thermodynamics. Following topic - the theory of waves - will give to the students basic insight into the properties of waves and will help to the students to understand that the presented description of the waves has a universal character in spite of the waves character. Particular types of waves, such as acoustic or optical waves are the subjects of the following section. Quantum mechanics and nuclear physics will complete the student's general education in physics. The knowledge gained in this course will help to the students in study of such modern areas as robotics, computer vision, measuring technique and will allow them to understand the principles of novel technologies and functioning of new electronic devices.			
AE3B14BP1	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			
AE3B14BPZS	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.			
AE3B31EOP	Elektrical 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.			
AE3B31TES	Signal theory	Z,ZK	5
Course explains basic terms and methods for continuous-time and discrete-time signal and system analysis.			
AE3B33IND	Individual project	KZ	7
AE3B33KUI	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.			
AE3B33OSD	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.			
AE3B35APE	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.			
AE3B35ARI	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.			
AE3B35IND	Individual Project	KZ	7

AE3B35MSD	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.			
AE3B38DSY	Distributed Systems and Computer Networks	Z,ZK	7
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.			
AE3B38IND	Individual Project	KZ	7
AE3B38SME	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.			
AE3B99RO	Robots	KZ	5
AE4B01DMA	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.			
AE4B01NUM	Numerical Analysis	Z,ZK	6
The course introduces to basic numerical methods of interpolation and approximation of functions, numerical differentiation and integration, solution of transcendent and ordinary differential equations and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demonstration of their properties using Maple and computer graphics.			
AE4B02FYZ	Physics for Informatics	Z,ZK	6
Within the framework of this course students gain the knowledge of selected parts of classical physics and dynamics of the physical systems. The introductory part of the course deals with the mass particle kinematics; dynamics, with the system of mass particles and rigid bodies. The students should be able to solve basic problems dealing with the description of mechanical systems. The introduction to the dynamics of the systems will allow to the students deeper understanding as well as analysis of these systems. The attention will be devoted namely to the application of the mathematical apparatus to the solution of real physical problems. Apart of this, the knowledge gained in this course will help to the students in the study of other disciplines, which they will meet during their further studies.			
AE4B17EAM	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.			
AE4B32PKS	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			
AE4B33DS	Database Systems	Z,ZK	6
Database Systems and their architecture, query languages, transactions, object-relational mapping			
AE4B33FLP	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.			
AE4B33OPT	Optimization	Z,ZK	7
The course provides fundamentals of mathematical optimisation in finite dimensional (euclidean) spaces: linear programming incl. duality, least squares, optimality conditions for non-linear problems, convexity, basic numerical algorithms, dynamic programming.			
AE4B33OSS	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.			
AE4B33RPZ	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.			
AE4B33SI	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.			
AE4B33ZUI	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.			
AE4B35PSR	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.

AE4B38DSP	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.			
AE4B38NVS	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.			
AE4B39TUR	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]			
AE4B39WA1	Web Applications Development	Z,ZK	6
Development of web applications. Designing web presentations using HTML/XHTML and CSS, scripting on the client side, creation of dynamic web applications on the server side. Main languages used: XHTML, CSS, JavaScript, PHP.			
AE4B77ASS	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.			
AE4B99RPH	Solving problems and other games	KZ	6
The main motivation is to let students to deal with real-world problems properly. When working in teams on real problems the student shall learn how to decompose the big problem, how to define interfaces, how to test and validate individual steps and so on. Many problems will actually be beyond the first-year-student skills. And many problem will not be solved in the optimal way. The unsolved parts should motivate the students to study difficult theoretical subjects. They should generate the important questions. Ideally, at the end of the subject, the student should be eager to study deeper about informatics.			
AE4B99SVP	Software or Research Project	KZ	6

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

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