Study plan

Name of study plan: Electrical Engineering and Computer Science (EECS)

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: Electrical Engineering and Computer Science
Type of study: Bachelor full-time
Required credits: 160
Elective courses credits: 20
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: 122
The role of the block: P

Code of the group: 2018_BEECSBAP
Name of the group: Bachelor Thesis
Requirement credits in the group: In this group you have to gain 20 credits
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)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
BEBAP20	**Bachelor thesis**	Z	20	12S	L,Z	P

Characteristics of the courses of this group of Study Plan: Code=2018_BEECSBAP Name=Bachelor Thesis

BEBAP20	Bachelor thesis	Z	20

Independent final thesis of a bachelor's study of a complex nature. The student chooses the topic of the thesis from the list of topics related to the studied program, which are listed by the FEL departments at KOS. The thesis will be defended before the commission for state final exams.

Code of the group: 2018_BEECSP
Name of the group: Compulsory subjetcs of the programme
Requirement credits in the group: In this group you have to gain 102 credits
Requirement courses in the group: In this group you have to complete at least 18 courses
Credits in the group: 102
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
BEEZZ	**Basic health and occupational safety regulations** *Radek Havlíček, Vladimír Kůla, Ivana Nová* ***Radek Havlíček*** *Vladimír Kůla (Gar.)*	Z	0	2BP+2BC	Z	P
BE5B16EPD	**Business Economics** *Tomáš Podivínský* ***Tomáš Podivínský*** *Tomáš Podivínský (Gar.)*	KZ	4	2P+2S	Z,L	P
BE5B01MA1	**Calculus 1** *Paola Vivi* ***Paola Vivi*** *Paola Vivi (Gar.)*	Z,ZK	7	4P+2S	Z	P
BE5B01MA2	**Calculus 2** *Paola Vivi* ***Paola Vivi*** *Petr Habala (Gar.)*	Z,ZK	7	4P+2S	L	P
BE5B01DEN	**Differential Equations&Numerical Methods** *Petr Habala* ***Petr Habala*** *Petr Habala (Gar.)*	Z,ZK	7	4P+2C	L	P
BE5B01DMG	**Discrete Mathematics and Graphs** *Jan Hamhalter* ***Jan Hamhalter*** *Jan Hamhalter (Gar.)*	Z,ZK	5	3P+1S	Z	P
BE5B34ELP	**Electron Devices** *Alexandr Laposa, Adam Bouřa* ***Adam Bouřa*** *Pavel Hazdra (Gar.)*	Z,ZK	5	2P+2L	L	P

BE5B31ZEO	**Fundamentals of Electrical Circuits** *Pavel Máša **Pavel Máša** Jiří Hospodka (Gar.)*	Z,ZK	5	2P+2S	Z	P
BE5B01LAL	**Linear Algebra** *Paola Vivi **Paola Vivi** Paola Vivi (Gar.)*	Z,ZK	8	4P+2S	Z	P
BE5B15MAA	**Mathematical Applications** *Stanislav Vítek, Jan Kyncl, Václav Vencovský **Jan Kyncl** Jan Kyncl (Gar.)*	Z,ZK	4	0P+4C	L	P
BE5B34MIK	**Microcontrollers** *Tomáš Teplý, Vladimír Janíček **Tomáš Teplý** Vladimír Janíček (Gar.)*	Z,ZK	6	2P+2L	L	P
BE5B02PH1	**Physics 1** *Stanislav Pekárek, Jaroslav Jíra **Stanislav Pekárek** Stanislav Pekárek (Gar.)*	Z,ZK	8	4P+1L+2C	L	P
BE5B02PH2	**Physics 2** *Stanislav Pekárek, Jaroslav Jíra **Stanislav Pekárek** Stanislav Pekárek (Gar.)*	Z,ZK	7	3P+1L+2C	Z	P
BE5B01PRS	**Probability and Statistics** *Kateřina Helisová, Bogdan Radović **Kateřina Helisová** Kateřina Helisová (Gar.)*	Z,ZK	7	4P+2S	Z	P
BE5B33PRG	**Programming Essentials** *Pavel Šindler, Petr Pošík, Milan Němý **Tomáš Svoboda** Tomáš Svoboda (Gar.)*	Z,ZK	6	2P+2C	Z	P
BE5B33PGE	**Programming for Engineers** *Radoslav Škoviera **Petr Pošík** Petr Pošík (Gar.)*	Z,ZK	6	2P+2C	L	P
BE5B99PRO	**Project** *Jaroslav Knápek, Jan Jandera **Jan Jandera** Jaroslav Knápek (Gar.)*	Z	10	2P+2S+6D	Z	P
BEEZB	**Safety in Electrical Engineering for a bachelor´s degree** *Radek Havlíček, Vladimír Kůla, Ivana Nová **Radek Havlíček** Vladimír Kůla (Gar.)*	Z	0	2BP+2BC	Z,L	P

Characteristics of the courses of this group of Study Plan: Code=2018_BEECSP Name=Compulsory subjetcs of the programme

BEEZZ	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. This program is obligatory.

BE5B16EPD	Business Economics	KZ	4

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.

BE5B01MA1	Calculus 1	Z,ZK	7

It is an introductory course to calculus of functions of one variable. It starts with limit and continuity of functions, derivative and its geometrical meaning and properties, graphing of functions. Then it covers indefinite integral, basic integration methods and integrating rational functions, definite integral and its applications. It concludes with introduction to Taylor series.

BE5B01MA2	Calculus 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. Fourier series are also introduced.

BE5B01DEN	Differential Equations&Numerical Methods	Z,ZK	7

This course introduces students to the classical theory of ordinary differential equations (separable and linear ODEs) and also to bsics of numerical methods (errors in calculations and stability, numerical solutions of algebraic and differential equations and their systems). The course takes advantage of the synnergy between theoretical and practical point of view.

BE5B01DMG	Discrete Mathematics and Graphs	Z,ZK	5

The aim of the course is to introduce students to fundamentals of Discrete Mathematics with focus on electrical engineering. The content of the course covers fundamentals of propositional and predicate logic, infinite sets with focus on the notion of cardinality of sets, binary relations with focus on equivalences and partial orderings; integers, relation modulo; algebraic structures including Boolean algebras. Further, the course covers basics of the Theory of Graphs.

BE5B34ELP	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 Spice simulator.

BE5B31ZEO	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.

BE5B01LAL	Linear Algebra	Z,ZK	8

The course covers standard basics of matrix calculus (determinants, inverse matrix) and linear algebra (basis, dimension, inner product spaces, linear transformations) including eigenvalues and eigenvectors. Matrix similarity, orthogonal bases, and bilinear and quadratic forms are also covered.

BE5B15MAA	Mathematical Applications	Z,ZK	4

The aim of the course is to obtain knowledge about mathematic programs used in electrical engineering. Student will acquire basic knowledge about MATLAB, MATHEMATICA and mathematical model assessment.

BE5B34MIK	Microcontrollers	Z,ZK	6

The goal of this course is to make students acquainted with recent interesting applications, smart sensors circuits and peripherals handled by microcontrollers. In a lab students will program their own application and measure its properties. Because of usage of a programming language C it will be possible to focus on the practical part of the realization.

BE5B02PH1	Physics 1	Z,ZK	8

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.

BE5B02PH2	Physics 2	Z,ZK	7
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.			
BE5B01PRS	Probability and Statistics	Z,ZK	7
Introduction to the theory of probability, mathematical statistics and computing methods together with their applications of praxis.			
BE5B33PRG	Programming Essentials	Z,ZK	6
The course focuses on understanding and mastering basic design principles of algorithms. It develops data abstraction coupled with the essential programming patterns. The emphasis is on creating readable and reusable programs.			
BE5B33PGE	Programming for Engineers	Z,ZK	6
BE5B99PRO	Project	Z	10
An individual student project. The student works on a topic of his or her interest under supervision of a faculty staff member. The topic selection is supposed to be consulted with the tutor. Aside the individual work and consultancies the project course is accompanied by lectures and practical seminars about economic aspects of projects, presentation skills and technical writing.			
BEEZB	Safety in Electrical Engineering for a bachelor´s degree	Z	0
The purpose of the safety course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it. This introductory course contains fundamentals of Safety Electrical Engineering. In this way the students receive qualification of instructed person that enables them to work on electrical equipment.			

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 38
The role of the block: PV

Code of the group: 2018_BEECSPV
Name of the group: Compulsory subjetcs of the branch
Requirement credits in the group: In this group you have to gain at least 38 credits (at most 87)
Requirement courses in the group: In this group you have to complete at least 7 courses
Credits in the group: 38
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
BE5B33ALG	**Algorithms** *Marko Genyk-Berezovskyj, Daniel Průša **Daniel Průša** Marko Genyk-Berezovskyj (Gar.)*	Z,ZK	6	2P+2C	Z	PV
BE5B35ARI	**Automatic Control** *Petr Hušek Martin Hromčík (Gar.)*	Z,ZK	7	4P+2L	L	PV
BE5B99CPL	**C Programming Language** *Tomáš Krajník, Yuliia Prokop **Jan Faigl** Jan Faigl (Gar.)*	Z,ZK	6	2P+2C+5D	Z	PV
BE5B32PKS	**Computer and Communication Networks** *Pavel Bezpalec **Pavel Bezpalec***	Z,ZK	6	2P + 2C	Z	PV
BE5B35APO	**Computer Architectures** *Pavel Píša, Richard Šusta **Pavel Píša** Pavel Píša (Gar.)*	Z,ZK	6	2P+2L	L	PV
BE5B33KUI	**Cybernetics and Artificial Intelligence** *Petr Pošík, Tomáš Svoboda **Tomáš Svoboda** Tomáš Svoboda (Gar.)*	Z,ZK	6	2P+2C	L	PV
BE5B14SP1	**Electric Machinery and Apparatus 1** *Pavel Mindl, Miroslav Chomát **Pavel Mindl** Pavel Mindl (Gar.)*	Z,ZK	5	3P+2L	L	PV
BE5B17EMT	**Electromagnetic Field Theory** *Jan Macháč, Zbyněk Škvor **Zbyněk Škvor** Zbyněk Škvor (Gar.)*	Z,ZK	6	3P+2C	Z	PV
BE5B35LSP	**Logic Systems and Processors** *Richard Šusta, Martin Hlinovský **Martin Hlinovský** Richard Šusta (Gar.)*	Z,ZK	6	3P+2L	Z	PV
BE5B13MVE	**Materials for Power Electrical Engineering** *Jan Zemen, Pavel Ctibor, Pavel Mach, Josef Sedláček, Karel Dušek, Neda Neykova **Pavel Mach** Pavel Mach (Gar.)*	Z,ZK	5	2P+2L	Z	PV
BE5B33RPZ	**Pattern Recognition and Machine Learning** *Ondřej Drbohlav, Jiří Matas, Jan Šochman **Jan Šochman** Jiří Matas (Gar.)*	Z,ZK	6	2P+2C	Z	PV
BE5B15EN1	**Power Engineering 1** *Ivo Doležel, Zdeněk Müller Zdeněk Müller (Gar.)*	Z,ZK	5	2P+2C	L	PV
BE5B15EN2	**Power Engineering 2** *Ivo Doležel, Zdeněk Müller*	Z,ZK	6	2P+2L	Z	PV
BE5B38SME	**Sensors and Measurement** *Pavel Ripka, Mattia Butta **Mattia Butta** Pavel Ripka (Gar.)*	Z,ZK	6	4P+2L	Z	PV
BE5B31TES	**Signal Theory** *Radoslav Bortel **Radoslav Bortel** Radoslav Bortel (Gar.)*	Z,ZK	5	2P+2C	L	PV

Characteristics of the courses of this group of Study Plan: Code=2018_BEECSPV Name=Compulsory subjetcs of the branch

BE5B33ALG	Algorithms	Z,ZK	6
In the course, the algorithms development is constructed with minimum dependency to programming language; nevertheless the lectures and seminars are based on Python. Basic data types a data structures, basic algorithms, recursive functions, abstract data types, stack, queues, trees, searching, sorting, special application algorithms, Dynamic programming. Students are able to design and construct non-trivial algorithms and to evaluate their affectivity.			
BE5B35ARI	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.			
BE5B99CPL	C Programming Language	Z,ZK	6
The course provides complete knowledge of the C programming language regarding a program structure operation, memory access, and multi-thread applications. The course emphasis a ?good? programming style to develop clean, easy-to-read, and re-usable code. Students are introduced into the process of the source code compilation and active debugging. Lectures introduce basic code structures and demonstration applications which link together partial constructs and practical coding aiming for cleanliness and structure of the source code, computational efficiency optimized using code profiling and debugging. Students are introduced into the fundamental principles of parallel multi-thread programming, synchronization mechanism and multi-thread application models. The end of the course presents introduction to principles of object oriented programming and C++.			
BE5B32PKS	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 course is aimed rather primarily practically then theoretically.			
BE5B35APO	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.			
BE5B33KUI	Cybernetics and Artificial Intelligence	Z,ZK	6
The course introduces the students into the field of artificial intelligence and gives the necessary basis for designing machine control algorithms. It advances the knowledge of state space search algorithms by including uncertainty in state transition. Students are introduced into reinforcement learning for solving problems when the state transitions are unknown, which also connects the artificial intelligence and cybernetics fields. Bayesian decision task introduces supervised learning. Learning from data is demonstrated on a linear classifier. Students practice the algoritms in computer labs.			
BE5B14SP1	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			
BE5B17EMT	Electromagnetic Field Theory	Z,ZK	6
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.			
BE5B35LSP	Logic Systems and Processors	Z,ZK	6
The course introduces the basic hardware structures of computing resources, their design, and architecture. It provides an overview of the possibilities of performing data operations at the hardware level and the design of embedded processor systems with peripherals on modern FPGA programmable logic circuits, which are increasingly widely used today. Students will learn their description in VHDL, from logic to more complex sequential circuits to practical finite state machine (FSM) designs. They will also master the correct design procedure using circuit simulation. Practical problems are solved using development boards used at hundreds of leading universities around the world. The course ends with RISC-V processor structure, cache, and pipeline processing.			
BE5B13MVE	Materials for Power Electrical Engineering	Z,ZK	5
At first a physical description of basic properties and basic types of materials for electrical engineering is carried out. Types of conductors, superconductors, insulators, magnetic materials and semiconductors, which are used in power electrical engineering, are presented. The stress is put on relationships between properties, technology and the use. The student will meet, in higher detail, with ceramics for electrical engineering, with properties of mica, glass and their applications, with environmental conductive joining, with materials for thin and thick films and with selected nanomaterials and their applications.			
BE5B33RPZ	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. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			
BE5B15EN1	Power Engineering 1	Z,ZK	5
The course informs students about basic principles and topologies of electrical transmission and distribution systems. There are explained key system elements and their parameters, steady, transient and failure phenomena, main rules for dimensioning and protecting.			
BE5B15EN2	Power Engineering 2	Z,ZK	6
This course is an introduction to the field of thermodynamic processes in thermal power plants, energy balances and structure of various renewable and conventional energy production technologies. Students will became also familiar with individual components of self consumption of power plants. The power generation and distribution are linked to high voltage systems and insulation materials. The fundamental theory of often used insulation materials and their propertis will be explained. Lightning and switching overvoltages and their impact to the insulation of electric power system will be discussed at the end of the course.			
BE5B38SME	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.			
BE5B31TES	Signal Theory	Z,ZK	5
Course explains basic terms and methods for representation and analysis of continuous-time and discrete-time signals and systems. Representations of signals and systems in continuous and discrete-time is developed for time and frequency domains through the Fourier transform. Bode and Nyquist plots as well as the Laplace transform and the Z-transform are used for stability analysis of feedback systems. Linearization by small-signal analysis is introduced. Filtering and filter design, sampling and interpolation are discussed. Analog and pulse modulation fundamentals and their characteristics are introduced. Characteristics of band-pass signals are discussed, including Hilbert transform and complex envelope. Fundamentals of random signals and their parameters are reviewed.			

Name of the block: Elective courses
Minimal number of credits of the block: 0
The role of the block: V

Code of the group: 2018_BEECSVOL
Name of the group: Elective special subjects
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
Note on the group: ~Student can choose arbitrary subject of the bachelor's program (EEM - Electrical Engineering, Power Engineering and Management, KME - Communications, Multimedia and Electronics, KYR - Cybernetics and Robotics, OI - Open Informatics, OES - Open Electronics Systems) which is not part of his curriculum. Student can choose with consideration of recommendation of the branch guarantee.\\

List of courses of this pass:

Code	Name of the course	Completion	Credits
BE5B01DEN	Differential Equations&Numerical Methods	Z,ZK	7
This course introduces students to the classical theory of ordinary differential equations (separable and linear ODEs) and also to bsics of numerical methods (errors in calculations and stability, numerical solutions of algebraic and differential equations and their systems). The course takes advantage of the synnergy between theoretical and practical point of view.			
BE5B01DMG	Discrete Mathematics and Graphs	Z,ZK	5
The aim of the course is to introduce students to fundamentals of Discrete Mathematics with focus on electrical engineering. The content of the course covers fundamentals of propositional and predicate logic, infinite sets with focus on the notion of cardinality of sets, binary relations with focus on equivalences and partial orderings; integers, relation modulo; algebraic structures including Boolean algebras. Further, the course covers basics of the Theory of Graphs.			
BE5B01LAL	Linear Algebra	Z,ZK	8
The course covers standard basics of matrix calculus (determinants, inverse matrix) and linear algebra (basis, dimension, inner product spaces, linear transformations) including eigenvalues and eigenvectors. Matrix similarity, orthogonal bases, and bilinear and quadratic forms are also covered.			
BE5B01MA1	Calculus 1	Z,ZK	7
It is an introductory course to calculus of functions of one variable. It starts with limit and continuity of functions, derivative and its geometrical meaning and properties, graphing of functions. Then it covers indefinite integral, basic integration methods and integrating rational functions, definite integral and its applications. It concludes with introduction to Taylor series.			
BE5B01MA2	Calculus 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. Fourier series are also introduced.			
BE5B01PRS	Probability and Statistics	Z,ZK	7
Introduction to the theory of probability, mathematical statistics and computing methods together with their applications of praxis.			
BE5B02PH1	Physics 1	Z,ZK	8
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.			
BE5B02PH2	Physics 2	Z,ZK	7
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.			
BE5B13MVE	Materials for Power Electrical Engineering	Z,ZK	5
At first a physical description of basic properties and basic types of materials for electrical engineering is carried out. Types of conductors, superconductors, insulators, magnetic materials and semiconductors, which are used in power electrical engineering, are presented. The stress is put on relationships between properties, technology and the use. The student will meet, in higher detail, with ceramics for electrical engineering, with properties of mica, glass and their applications, with environmental conductive joining, with materials for thin and thick films and with selected nanomaterials and their applications.			
BE5B14SP1	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			
BE5B15EN1	Power Engineering 1	Z,ZK	5
The course informs students about basic principles and topologies of electrical transmission and distribution systems. There are explained key system elements and their parameters, steady, transient and failure phenomena, main rules for dimensioning and protecting.			

BE5B15EN2	Power Engineering 2	Z,ZK	6
This course is an introduction to the field of thermodynamic processes in thermal power plants, energy balances and structure of various renewable and conventional energy production technologies. Students will became also familiar with individual components of self consumption of power plants. The power generation and distribution are linked to high voltage systems and insulation materials. The fundamental theory of often used insulation materials and their propertis will be explained. Lightning and switching overvoltages and their impact to the insulation of electric power system will be discussed at the end of the course.			
BE5B15MAA	Mathematical Applications	Z,ZK	4
The aim of the course is to obtain knowledge about mathematic programs used in electrical engineering. Student will acquire basic knowledge about MATLAB, MATHEMATICA and mathematical model assessment.			
BE5B16EPD	Business Economics	KZ	4
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.			
BE5B17EMT	Electromagnetic Field Theory	Z,ZK	6
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.			
BE5B31TES	Signal Theory	Z,ZK	5
Course explains basic terms and methods for representation and analysis of continuous-time and discrete-time signals and systems. Representations of signals and systems in continuous and discrete-time is developed for time and frequency domains through the Fourier transform. Bode and Nyquist plots as well as the Laplace transform and the Z-transform are used for stability analysis of feedback systems. Linearization by small-signal analysis is introduced. Filtering and filter design, sampling and interpolation are discussed. Analog and pulse modulation fundamentals and their characteristics are introduced. Characteristics of band-pass signals are discussed, including Hilbert transform and complex envelope. Fundamentals of random signals and their parameters are reviewed.			
BE5B31ZEO	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.			
BE5B32PKS	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 course is aimed rather primarily practically then theoretically.			
BE5B33ALG	Algorithms	Z,ZK	6
In the course, the algorithms development is constructed with minimum dependency to programming language; nevertheless the lectures and seminars are based on Python. Basic data types a data structures, basic algorithms, recursive functions, abstract data types, stack, queues, trees, searching, sorting, special application algorithms, Dynamic programming. Students are able to design and construct non-trivial algorithms and to evaluate their affectivity.			
BE5B33KUI	Cybernetics and Artificial Intelligence	Z,ZK	6
The course introduces the students into the field of artificial intelligence and gives the necessary basis for designing machine control algorithms. It advances the knowledge of state space search algorithms by including uncertainty in state transition. Students are introduced into reinforcement learning for solving problems when the state transitions are unknown, which also connects the artificial intelligence and cybernetics fields. Bayesian decision task introduces supervised learning. Learning from data is demonstrated on a linear classifier. Students practice the algoritms in computer labs.			
BE5B33PGE	Programming for Engineers	Z,ZK	6
BE5B33PRG	Programming Essentials	Z,ZK	6
The course focuses on understanding and mastering basic design principles of algorithms. It develops data abstraction coupled with the essential programming patterns. The emphasis is on creating readable and reusable programs.			
BE5B33RPZ	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. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			
BE5B34ELP	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 Spice simulator.			
BE5B34MIK	Microcontrollers	Z,ZK	6
The goal of this course is to make students acquainted with recent interesting applications, smart sensors circuits and peripherals handled by microcontrollers. In a lab students will program their own application and measure its properties. Because of usage of a programming language C it will be possible to focus on the practical part of the realization.			
BE5B35APO	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.			
BE5B35ARI	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.			
BE5B35LSP	Logic Systems and Processors	Z,ZK	6
The course introduces the basic hardware structures of computing resources, their design, and architecture. It provides an overview of the possibilities of performing data operations at the hardware level and the design of embedded processor systems with peripherals on modern FPGA programmable logic circuits, which are increasingly widely used today. Students will learn their description in VHDL, from logic to more complex sequential circuits to practical finite state machine (FSM) designs. They will also master the correct design procedure			

	using circuit simulation. Practical problems are solved using development boards used at hundreds of leading universities around the world. The course ends with RISC-V processor structure, cache, and pipeline processing.		
BE5B38SME	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.		
BE5B99CPL	C Programming Language	Z,ZK	6
	The course provides complete knowledge of the C programming language regarding a program structure operation, memory access, and multi-thread applications. The course emphasis a ?good? programming style to develop clean, easy-to-read, and re-usable code. Students are introduced into the process of the source code compilation and active debugging. Lectures introduce basic code structures and demonstration applications which link together partial constructs and practical coding aiming for cleanliness and structure of the source code, computational efficiency optimized using code profiling and debugging. Students are introduced into the fundamental principles of parallel multi-thread programming, synchronization mechanism and multi-thread application models. The end of the course presents introduction to principles of object oriented programming and C++.		
BE5B99PRO	Project	Z	10
	An individual student project. The student works on a topic of his or her interest under supervision of a faculty staff member. The topic selection is supposed to be consulted with the tutor. Aside the individual work and consultancies the project course is accompanied by lectures and practical seminars about economic aspects of projects, presentation skills and technical writing.		
BEBAP20	Bachelor thesis	Z	20
	Independent final thesis of a bachelor's study of a complex nature. The student chooses the topic of the thesis from the list of topics related to the studied program, which are listed by the FEL departments at KOS. The thesis will be defended before the commission for state final exams.		
BEEZB	Safety in Electrical Engineering for a bachelor´s degree	Z	0
	The purpose of the safety course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it. This introductory course contains fundamentals of Safety Electrical Engineering. In this way the students receive qualification of instructed person that enables them to work on electrical equipment.		
BEEZZ	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. This program is obligatory.		

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