Study plan

Name of study plan: Medical electronics and bioinformatics

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: Medical Electronics and Bioinformatics
Type of study: Bachelor full-time
Required credits: 170
Elective courses credits: 10
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: 146
The role of the block: P

Code of the group: 2018_BBIOBAP
Name of the group: Bachelor Project
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 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
BBAP20	**Bachelor thesis** *Roman Čmejla Roman Čmejla (Gar.)*	Z	20	12S	L,Z	P

Characteristics of the courses of this group of Study Plan: Code=2018_BBIOBAP Name=Bachelor Project

BBAP20	Bachelor thesis	Z	20

Code of the group: 2018_BBIOP
Name of the group: Compulsory subjects of the programme
Requirement credits in the group: In this group you have to gain 126 credits
Requirement courses in the group: In this group you have to complete 25 courses
Credits in the group: 126
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
BAB02BFY	**Biophysics** *Lukáš Matera, Ladislav Sieger, Vratislav Fabián, Jaroslav Jíra **Vratislav Fabián** Vratislav Fabián (Gar.)*	Z,ZK	4	2P+2L	L	P
BAB34BMS	**Biomedical sensors** *Miroslav Husák, Alexandr Laposa, Adam Bouřa, Jan Novák **Miroslav Husák** Miroslav Husák (Gar.)*	Z,ZK	4	2P+2L	Z	P
BAB02CHE	**Chemistry for Bioengineering** *Jan Přech, Michal Mazur **Jan Přech** Jan Přech (Gar.)*	Z,ZK	3	2P+1L	Z	P
B0B01DRN	**Differencial Equations and Numerical Analysis** *Petr Habala, Jakub Rondoš, Jakub Staněk, Daniel Gromada, Josef Dvořák **Petr Habala** Petr Habala (Gar.)*	Z,ZK	4	2P+2C	L	P
B4M33DZO	**Digital image** *Ondřej Drbohlav, Daniel Sýkora **Daniel Sýkora** Daniel Sýkora (Gar.)*	Z,ZK	6	2P+2C	Z,L	P
B2B38EMBA	**Electrical Measurements** *Jakub Svatoš **Jakub Svatoš** Jakub Svatoš (Gar.)*	Z,ZK	5	2P+2L	Z	P
BAB17EMP	**Electromagnetic Field** *Miloslav Čapek **Miloslav Čapek** Miloslav Čapek (Gar.)*	Z,ZK	5	2P+2C	Z	P

B2B31EO1	**Electronic Circuits 1** *Jiří Hospodka, Michal Šimek, Jan Havlík **Jiří Hospodka** Jiří Hospodka (Gar.)*	Z,ZK	4	2P+2L	L	P
B3B02FY1A	**Physics 1** *Petr Koníček, Michal Bednařík **Michal Bednařík** Michal Bednařík (Gar.)*	Z,ZK	7	4P+1L+2C	L	P
B3B02FY2	**Physics 2** *Petr Koníček, Michal Bednařík, Marek Brothánek, Vojtěch Jandák **Michal Bednařík** Michal Bednařík (Gar.)*	Z,ZK	6	3P+1L+2C	Z	P
BAB31GEN	**Genetics** *Eduard Kočárek **Eduard Kočárek** Eduard Kočárek (Gar.)*	ZK	3	2P	Z	P
B0B01KAN	**Complex Analysis** *Zdeněk Mihula, Hana Turčinová **Zdeněk Mihula** Zdeněk Mihula (Gar.)*	Z,ZK	5	2P+2S	Z	P
B0B01LAGA	**Linear Algebra** *Jakub Rondoš, Daniel Gromada, Josef Dvořák, Jiří Velebil, Martin Bohata, Alena Gollová, Natalie Žukovec, Matěj Dostál **Jiří Velebil** Jiří Velebil (Gar.)*	Z,ZK	7	4P+2S	Z	P
B0B01MA1A	**Mathematical Analysis 1** *Josef Dvořák, Martin Bohata, Veronika Sobotíková, Karel Pospíšil **Veronika Sobotíková** Veronika Sobotíková (Gar.)*	Z,ZK	6	4P+2S	Z	P
B0B01MA2	**Mathematical Analysis 2** *Hana Turčinová, Martin Bohata, Karel Pospíšil, Petr Hájek, Jaroslav Tišer, Miroslav Korbelář, Paola Vivi **Petr Hájek** Jaroslav Tišer (Gar.)*	Z,ZK	7	4P+2S	L,Z	P
B0B33OPT	**Optimization** *Tomáš Werner, Petr Olšák, Mirko Navara, Tomáš Kroupa **Tomáš Werner** Tomáš Werner (Gar.)*	Z,ZK	7	4P+2C	Z,L	P
BAB36PRGA	**Programming in C** *Jan Faigl **Jan Faigl** Jan Faigl (Gar.)*	Z,ZK	6	2P+2C	L	P
BBPROJ4	**Bachelor Project** *Roman Čmejla, Veronika Sobotíková, Radek Janča, Jan Kybic **Jan Kybic** Roman Čmejla (Gar.)*	Z	4	4s	Z,L	P
B4B33RPZ	**Recognition and Machine Learning** *Ondřej Drbohlav, Jiří Matas, Jan Šochman **Jan Šochman** Jiří Matas (Gar.)*	Z,ZK	6	2P+2C	Z	P
B2B37SAS	**Signals and systems** *Václav Navrátil, Karel Fliegel, Pavel Puričer **Karel Fliegel** Karel Fliegel (Gar.)*	Z,ZK	5	2P+2C	L	P
B0B01STP	**Statistics and Probability** *Jakub Staněk, Miroslav Korbelář, Kateřina Helisová, Bogdan Radović **Kateřina Helisová** Kateřina Helisová (Gar.)*	Z,ZK	5	2P+2S	L	P
BAB31AF1	**Fundamentals of Anatomy and Physiology I** *Šárka Salavová, Kamila Čížková **Šárka Salavová** Šárka Salavová (Gar.)*	KZ	4	2P+2L	Z	P
BAB31AF2	**Fundamentals of Anatomy and Physiology II** *Kamila Čížková **Kamila Čížková** Kamila Čížková (Gar.)*	Z,ZK	4	2P+2L	L	P
B2B31ZEOA	**Fundamentals of Electric Circuits** *Roman Čmejla, Pavel Máša **Roman Čmejla** Roman Čmejla (Gar.)*	Z,ZK	5	2P+2L	L	P
BAB31ZZS	**Basic Signal Processing** *Radek Janča **Radek Janča** Roman Čmejla (Gar.)*	KZ	4	2P+2C	Z	P

Characteristics of the courses of this group of Study Plan: Code=2018_BBIOP Name=Compulsory subjects of the programme

BAB02BFY	Biophysics	Z,ZK	4

The course is focused on physical processes associated with blood flow and blood gas exchange, including description of events on biological membranes. Further, the possibilities of measuring advanced hemodynamic parameters of the bloodstream are discussed. A large space is devoted to the problems of hemodialysis and peritoneal dialysis. In the second part of the semester students are acquainted with the properties of human tissue and body fluids, including methods of their measurement. This knowledge is complemented by the basics of optics and acoustics, always in relation to biological systems. Part of the course are laboratory exercises in a modern laboratory, which suitably complement the theoretical knowledge of students from lectures.

BAB34BMS	Biomedical sensors	Z,ZK	4

Sensors and microsensors used in biomedicine. Physical principles of operation of sensors and microsensors for sensing: temperature, pressure, deformation, vibration, mechanical quantities, magnetic field, flow, chemical and biochemical quantities, etc. Classification, parameters. Processing of sensor signals, application of sensors in biomedicine. Nanotechnology. Sensors and microsystems for biomedical diagnostics (Lab-on-chip, etc.).

BAB02CHE	Chemistry for Bioengineering	Z,ZK	3

Students will learn the basic areas of applied chemistry in biomedical engineering and technology. At the same time, this course will introduce other chemical disciplines. During laboratory exercises, students should acquire basic laboratory techniques used in chemical laboratories focused primarily on the analysis of substances and materials. Laboratory exercises are preceded by exercises focused on practical calculations for laboratory practice.

B0B01DRN	Differencial Equations and Numerical Analysis	Z,ZK	4

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.

B4M33DZO	Digital image	Z,ZK	6

This course presents an overview of basic methods for digital image processing. It deals with practical techniques that have an interesting theoretical basis but are not difficult to implement. Seemingly abstract concepts from mathematical analysis, probability theory, or optimization come to life through visually engaging applications. The course focuses on fundamental principles (signal sampling and reconstruction, monadic operations, histogram, Fourier transform, convolution, linear and non-linear filtering) and more advanced editing techniques, including image stitching, deformation, registration, and segmentation. Students will practice the selected topics through six implementation tasks, which will help them learn the theoretical knowledge from the lectures and use it to solve practical problems

B2B38EMBA	Electrical Measurements	Z,ZK	5

Methods of measurement of electrical 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 on several basic electronic measuring instruments and explaining the fundamentals of magnetic measurements and basic information concerning measurement systems.

BAB17EMP	Electromagnetic Field	Z,ZK	5

This course gets its students acquinted with principles and applied electromagnetic field theory basics.

B2B31EO1	Electronic Circuits 1	Z,ZK	4

The course introduces basic circuits with operational amplifiers, continues with the description of linear systems, analysis of their characteristics and fundamentals of synthesis frequency filters. It deals with the principles and features of circuits for generating signals and a controlled oscillator including the PLL circuit and its use. The last part of the course is devoted to basic amplifier stages with transistors.

B3B02FY1A	Physics 1	Z,ZK	7

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.

B3B02FY2	Physics 2	Z,ZK	6

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.

BAB31GEN	Genetics	ZK	3

The subject provides students of technical dsciplines with basic information about genetics with an emphasis on modern genetic disciplines and knowledge that is closely related to the issue of medical electronics and especially bioinformatics. The focus is on the organization and function of the human genome, including its possible pathologically significant changes and the techniques used to determine them. Students will also learn basic information about clinical genetics, genetic counseling, genetic testing, as well as their possible ethical and legal issues. The conclusion of the course also deals with original and modern approaches enabling targeted editing of the genome, especially the so-called gene therapy. Although the majority of the curriculum is oriented towards the human organism, knowledge about the genetics of other living systems - especially prokaryotes and viruses - is part of the teaching.

B0B01KAN	Complex Analysis	Z,ZK	5

The course is an introduction to the fundamentals of complex analysis and its applications. The basic principles of Fourier, Laplace, and Z-transform are explained, including their applications, particularly to solving differential and difference equations.

B0B01LAGA	Linear Algebra	Z,ZK	7

The course covers introductory topics of linear algebra. It begins with fundamental concepts related to vector spaces and linear transform (such as linear dependence and independence of vectors, bases, coordinates of vectors, etc.). The next part of the course is devoted to matrix theory (determinants, inverse matrix, matrices of linear transformation, eigenvalues and eigenvectors). Applications include solving systems of linear equations, geometry in three-dimensional space (including dot and cross products), and the singular value decomposition of a matrix.

B0B01MA1A	Mathematical Analysis 1	Z,ZK	6

This is an introductory course to differential and integral calculus of functions of one real variable.

B0B01MA2	Mathematical Analysis 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.

B0B33OPT	Optimization	Z,ZK	7

The course provides an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated with a number of examples. You will refresh and extend many topics that you know from linear algebra and calculus courses.

BAB36PRGA	Programming in C	Z,ZK	6

The course targets to gain a deep, comprehensive knowledge of the C programming language in terms of program operation, access and memory management, and the development of multi-threaded applications. The course emphasizes acquiring programming habits for creating readable and reusable programs. Students get acquainted with the compilation of the source codes and their debugging. Lectures are based on the presentation of basic software constructs and demonstration of motivational programs with practical constructs pointing to the readability and structure of source code, real computational complexity, and related tools for profiling and debugging. Students get acquainted with the principles of parallel programming of multi-threaded applications, synchronization mechanisms, and models of multi-threaded applications. At the end of the semester, the basic features of the object-oriented C ++ extension are briefly presented.

BBPROJ4	Bachelor Project	Z	4
B4B33RPZ	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.

B2B37SAS	Signals and systems	Z,ZK	5

Introductory course focused on a description of continuous- and discrete-time signals and systems in time and frequency domains. The course also introduces the basic characteristics of bandpass signals, analog modulations and random signals.

B0B01STP	Statistics and Probability	Z,ZK	5

The aim of the course is to introduce students to the fundamentals of probability theory and mathematical statistics, their computational methods as well as applications of these mathematical tools to practical examples.

BAB31AF1	Fundamentals of Anatomy and Physiology I	KZ	4

This theoretical and practical course introduces students to professional anatomical terminology while providing them with basic knowledge of human anatomy and physiology.

BAB31AF2	Fundamentals of Anatomy and Physiology II	Z,ZK	4

The course introduces the functions of the individual organ systems of the human body under resting and stress conditions. Special attention is paid to transport systems and the regulation of homeostasis. The basic possibilities of examination of these systems are presented.

B2B31ZEOA	Fundamentals of Electric Circuits	Z,ZK	5

The course describes the basic methods of analysis of electrical circuits. In the lectures, students are introduced to the basic active and passive circuit elements, circuit quantities, important circuit theorems and methods of circuit analysis in stationary and harmonic steady state as well as during transients caused by changes in the circuit. The seminars are aimed at practicing knowledge in the analysis of basic electrical circuits, supplemented by simulations and simple measurements.

BAB31ZZS	Basic Signal Processing	KZ	4

An introductory course on digital signal processing (DSP). The course introduces the basic digital signals theory with an emphasis on practical applications and analysis of real signals in time. Exercises are built for progressive mastery of the MATLAB programming environment, which provides a friendly and easy-to-use user environment with graphical and audio output. You will apply the acquired knowledge in other courses, projects, theses, and especially in broader engineering and biomedical practice.

Code of the group: 2015_BZAJ
Name of the group: Exam from the english language
Requirement credits in the group:
Requirement courses in the group: In this group you have to complete 2 courses
Credits in the group: 0
Note on the group:

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
B0B04B1K	**English language B1 - classified assessment** *Markéta Havlíčková, Pavla Péterová, Erik Peter Stadnik, Michael Ynsua, Dana Saláková, Petra Juna Jennings* ***Petra Juna Jennings*** *Petra Juna Jennings (Gar.)*	KZ	0	0C	Z,L	P
B0B04B2Z	**English language B2 - exam** *Markéta Havlíčková, Michael Ynsua, Dana Saláková, Petra Juna Jennings* ***Petra Juna Jennings*** *Petra Juna Jennings (Gar.)*	Z,ZK	0	0C	Z,L	P

Characteristics of the courses of this group of Study Plan: Code=2015_BZAJ Name=Exam from the english language

B0B04B1K	English language B1 - classified assessment	KZ	0
verifying of the student´s skills of B1 level			
B0B04B2Z	English language B2 - exam	Z,ZK	0

I) The B2 English Exam is a compulsory subject for all Faculty of Electrical Engineering students at the Czech Technical University. According to the Study and Examination Rules and Regulations for Students at CTU (Part III, Article 4), a compulsory subject is one whose completion is a necessary condition in order to successfully complete the study programme. In addition, this requires the passing of an examination evaluated on the scale A, B, C, D, or E (SERR Part III, Article 6). II) According to the Common European Framework of Reference for Languages (CEFR), an international standard for describing language ability, the definition of an English language learner who has achieved the B2 (Upper-Intermediate) level is one who can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options. III) Students who have successfully passed an approved international exam within the past five years may present their certificate to the Department of Languages, Faculty of Electrical Engineering. Upon approval, students are then exempt from both the Written Test and the Oral Part. For a list of approved international exams go to the department website: http://jazyky.fel.cvut.cz/

Name of the block: Compulsory elective courses
Minimal number of credits of the block: 24
The role of the block: PV

Code of the group: 2018_BBIOPV
Name of the group: Compulsory subjects of the programme
Requirement credits in the group: In this group you have to gain at least 14 credits (at most 86)
Requirement courses in the group: In this group you have to complete at least 3 courses
Credits in the group: 14
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
B4B33ALG	**Algorithms** *Marko Genyk-Berezovskyj, Daniel Průša* ***Daniel Průša*** *Marko Genyk-Berezovskyj (Gar.)*	Z,ZK	6	2P+2C	Z	PV
BAB37APO	**Applied Optics** *Petr Páta, Jan Bednář, Lukáš Krauz* ***Jan Bednář*** *Petr Páta (Gar.)*	Z,ZK	4	2P+2L	L	PV
2241050	**Biomechanics for Bachelors** *Matej Daniel* ***Matej Daniel*** *Matej Daniel (Gar.)*	Z,ZK	4	2P+2C+0L		PV
BAB34BSP	**Biomedical Sensors Practically** *Alexandr Laposa, Adam Bouřa* ***Adam Bouřa*** *Adam Bouřa (Gar.)*	KZ	4	2P+2L	Z	PV
B0B36DBS	**Database Systems** *Martin Řimnáč, Václav Kratochvíl* ***Martin Řimnáč*** *Martin Řimnáč (Gar.)*	Z,ZK	6	2P+2C+4D	L	PV
B2B31EO2	**Electronic Circuits 2** *Jiří Hospodka* ***Jiří Hospodka*** *Jiří Hospodka (Gar.)*	Z,ZK	4	2P+2L	Z	PV
B3B33KUI	**Cybernetics and Artificial Intelligence** *Tomáš Svoboda, Petr Pošík* ***Tomáš Svoboda*** *Tomáš Svoboda (Gar.)*	Z,ZK	6	2P+2C	L	PV
B3B38LPE	**Laboratories of Industrial Electronics and Sensors** *Jan Fischer, Tomáš Drábek, Michal Janošek, Vojtěch Petrucha* ***Vojtěch Petrucha*** *Vojtěch Petrucha (Gar.)*	KZ	4	0P+4L	L	PV
B3B33LAR	**Laboratory of robotics** *Vladimír Petrík, Pavel Krsek, Libor Wagner* ***Pavel Krsek*** *Pavel Krsek (Gar.)*	KZ	4	0P+4L	L	PV
B0B01LGR	**Logic and Graphs** *Alena Gollová, Natalie Žukovec, Matěj Dostál* ***Alena Gollová*** *Marie Demlová (Gar.)*	Z,ZK	5	3P+2S	Z,L	PV

BAB34MNS	*Miroslav Husák, Alexandr Laposa, Adam Bouřa* ***Miroslav Husák*** *Miroslav Husák (Gar.)*	Z,ZK	4	2P+2L	Z	PV
B2B34MIK	**Microcontrollers** *Jan Novák, Tomáš Teplý, Vladimír Janíček* ***Tomáš Teplý*** *Vladimír Janíček (Gar.)*	Z,ZK	4	2P+2C	Z	PV
B4B38NVS	**Embedded Systems Design** *Jan Fischer, Vojtěch Petrucha* ***Jan Fischer*** *Jan Fischer (Gar.)*	Z,ZK	6	2P+2L	Z	PV
B4B01NUM	**Numerical Analysis** *Mirko Navara, Aleš Němeček* ***Mirko Navara*** *Mirko Navara (Gar.)*	Z,ZK	6	2P+2C	Z	PV
B3B33ROB	**Robotics**	Z,ZK	5	2P+2L	Z	PV
B2B17TBK	**Wireless Communication Technique** *Přemysl Hudec, Pavel Pechač, Tomáš Kořínek, Viktor Adler, Václav Kabourek, Jan Spáčil* ***Přemysl Hudec*** *Přemysl Hudec (Gar.)*	KZ	4	2P+2L	L	PV
B0B02UAK	**Introduction to Acoustic** *Marek Brothánek, Ondřej Jiříček* ***Ondřej Jiříček*** *Ondřej Jiříček (Gar.)*	KZ	4	2P+2L	L	PV
B4B36ZUI	**Introduction to Artificial Intelligence** *Viliam Lisý, Branislav Bošanský* ***Branislav Bošanský*** *Michal Pěchouček (Gar.)*	Z,ZK	6	2P+2C	L	PV

Characteristics of the courses of this group of Study Plan: Code=2018_BBIOPV Name=Compulsory subjects of the programme

B4B33ALG	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 Java. 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 effectivity.			
BAB37APO	Applied Optics	Z,ZK	4
2241050	Biomechanics for Bachelors	Z,ZK	4
BAB34BSP	Biomedical Sensors Practically	KZ	4
The aim of the course is to gain experience with design, implementation and testing of practical constructions with sensors for biomedical applications and with regard to the needs of students of FEE who will realize the practical final work.			
B0B36DBS	Database Systems	Z,ZK	6
The course is designed as a basic database course mainly aimed at the student ability to design a relational data model and to use the SQL language for data definition as well as for data querying and to choose the appropriate degree of transaction isolation. Students will also get acquainted with the most commonly used indexing techniques, database system architecture and their management. They will verify their knowledge during the elaboration of a continuously submitted seminar task.			
B2B31EO2	Electronic Circuits 2	Z,ZK	4
The course builds on the basic electric circuits course. It introduces multistage transistor amplifiers and basic applications in the field of electronic systems. Students become familiar with design and measurement of electronic systems, including nonlinear applications with regard to the real characteristics of operational amplifiers. Next operating principles and parameters of power amplifiers, linear stabilizers, switching power supply and D/A and A/D converters are presents.			
B3B33KUI	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.			
B3B38LPE	Laboratories of Industrial Electronics and Sensors	KZ	4
The objective of the "Laboratories" is to introduce students in a playful and interactive way with basic blocks of an industrial sensor system - from the sensor itself, through signal processing circuits, analog to digital signal conversion, software processing by a microcontroller up to the sending of the results to the superior system or database and their presentation to the user within the concept "Internet of Things".			
B3B33LAR	Laboratory of robotics	KZ	4
During this laboratory courses the students are introduced with the practical robotics through solving of practical tasks. Students are working in laboratories in groups which consist of 3 or 4 members. During the semester, each group of students jointly solve one practical problem in the field of robotics. Tasks are designed to introduce students with robotics (manipulators and mobile robots). The students should utilize the basic knowledge obtained in previous study (eg. mathematics, physics, electronics, software development). Students can select specific task from few tasks with different specialization, which are announced each semester. Tasks differs between semesters. An integral part of the solution of the problem is cooperation and communication in the student team.			
B0B01LGR	Logic and Graphs	Z,ZK	5
This course covers basics of mathematical logic and graph theory. Syntax and semantics of propositional and predicate logic are introduced. The importance of the notion of consequence and of the relationship between a formula and its model is stressed. Further, basic notions from graph theory are introduced.			
BAB34MNS		Z,ZK	4
The content of the course are knowledge of new principles of operation of components and systems with micro-dimensions, microsystems, microsensors and microactuators usable in biomedicine, microsurgery, etc. The course points to new possibilities of implementation and application of integrated microcomponents working with various physical and biochemical principles and quantities using mainly MEMS technology. Physical principles of operation of microsystems and microactuators, classification, parameters, design, integration, signal processing, linearization, calibration, system intelligence, applications of microactuators (electrostatic, piezoelectric, thermal, chemical and biochemical, optical, ..). The course introduces modern solutions in biomedicine, action elements in conjunction with sensors, whose operation is based on basic physical and biochemical principles, including basic applications in micromanipulation, microrobots. The course presents the principles of touch screens, energy microgenerators.			
B2B34MIK	Microcontrollers	Z,ZK	4
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 applications and measure actual properties. Because of usage of a programming language C it will be possible to focus on the practical part of the realization.			
B4B38NVS	Embedded Systems Design	Z,ZK	6
The course deals with design of embedded systems using ARM based microcontrollers.			
B4B01NUM	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 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.			
B3B33ROB	Robotics	Z,ZK	5
The course is an introduction into industrial robotics with the emphasis on the industrial robots and manipulators. The robot kinematics is thoroughly studied. The student shall be able to choose, design, and program industrial robot and integrate it into the robotic cell after passing the course.			

B2B17TBK	Wireless Communication Technique	KZ	4

Wireless communications belong to the fastest developing technical fields. Besides widely used mobile telephony systems, this field also includes many other both mobile and stationary communicating systems. Different types of radio modems are also built in the majority of electronic devices like PCs, tablets, notebooks, cameras, etc. With expected fast development of Internet of Things, operation of billions of wireless sensors is expected. The subject is common to all students of the Electronics and Communication study program, its main purpose is to teach all important aspects of this technical branch. Obtained knowledge should enable the students to design, project, adjust or manufacture any wireless communication system or its components. Besides wireless system analysis, the lectures include review of physical backgrounds, survey of the most important existing radio systems together with corresponding operational frequencies, description of electromagnetic wave propagation and related antennas. Instructions concerning propagation also cover behavior of EM waves in an urban environment or inside buildings. Lectures concerning analysis of typical wireless systems also cover description of related radio-frequency, microwave and mm-wave circuits and components. Exercises include practical calculations of wireless systems, computer analysis and synthesis of important structures and circuits, and related laboratory measurements.

B0B02UAK	Introduction to Acoustic	KZ	4

The subject provides overview of main parts of acoustics. In first lectures there is introduction to basic types of sound fields, its solutions and properties. Next chapter deals with introduction to building and room acoustics. The second half of the course deals with introductions to physiological acoustics, psychoacoustics, musical acoustics, hygiene legislation and ultrasound, infrasound and their measurement.

B4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6

The aim of the course is to cover the basics of symbolic artificial intelligence. We will focus on algorithms of informed and uninformed state space search, problem representation and solving, representation of knowledge using formal logic, methods of automated reasoning, and an introduction to Markov decision making, and to two-player games. 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.

Code of the group: 2018_BBIOPROG
Name of the group: Programing
Requirement credits in the group: In this group you have to gain at least 6 credits (at most 12)
Requirement courses in the group: In this group you have to complete at least 1 course (at most 2)
Credits in the group: 6
Note on the group:

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors, **authors** and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
B3B33ALP	**Algorithms and Programming** *Vojtěch Vonásek **Vojtěch Vonásek** Vojtěch Vonásek (Gar.)*	Z,ZK	6	2P+2C	Z	PV
BAB37ZPR	**Programming Essentials** *Stanislav Vítek **Stanislav Vítek** Stanislav Vítek (Gar.)*	Z,ZK	6	2P+2C	Z	PV

Characteristics of the courses of this group of Study Plan: Code=2018_BBIOPROG Name=Programing

B3B33ALP	Algorithms and Programming	Z,ZK	6

This subject will give students a basic understanding of algorithms and programming and teach them to design, implement and test algorithms for simple tasks. The students will understand the notion of computational complexity. They will learn about basic program building blocks such as loops, conditional statements, variables, functions and recursion. We will introduce the most often used data structures (queue, stack, list, array etc) and operations on them. We will show the basic algorithms, for example for searching and sorting. Students will learn to write simple programs in Python.

BAB37ZPR	Programming Essentials	Z,ZK	6

Code of the group: 2018_BBIOMP
Name of the group: Introduction to Engineering
Requirement credits in the group: In this group you have to gain at least 4 credits (at most 8)
Requirement courses in the group: In this group you have to complete at least 1 course (at most 2)
Credits in the group: 4
Note on the group:

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors, **authors** and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
BAB31UBI	**Introduction to bioengineering** *Jan Kybic, Michal Novotný, Jan Holub, Petr Ježdík, Jiří Kléma **Michal Novotný** Michal Novotný (Gar.)*	KZ	4	2P+2L	Z	PV
B2B15UELA	**Introduction to Electrical Engineering** *Zdeněk Müller, Pavel Hrzina **Pavel Hrzina** Zdeněk Müller (Gar.)*	KZ	4	2P+1L	Z	PV

Characteristics of the courses of this group of Study Plan: Code=2018_BBIOMP Name=Introduction to Engineering

BAB31UBI	Introduction to bioengineering	KZ	4

The course presents the basics of biomedical engineering and provides illustrative examples of projects performed by the faculty teams.

B2B15UELA	Introduction to Electrical Engineering	KZ	4

The course expands students knowledge of topics in power engineering. It provides a basic overview of the electricity production, transmission, distribution, and consumption chain, introduces the principles of electrical machines, and broadens understanding of materials used in electrical engineering.

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_BBIOH
Name of the group: Humanities subjects
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
Note on the group:

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
B0B16ET1	**Ethic 1** *Vladimír Slámečka* ***Vladimír Slámečka*** *Vladimír Slámečka (Gar.)*	KZ	4	2P+2C	Z	v
B0B16FIL	**Philosophy** *Peter Zamarovský* ***Peter Zamarovský*** *Peter Zamarovský (Gar.)*	ZK	2	2P+0S	Z,L	v
B0B16FI1	**Philosophy 1** *Peter Zamarovský* ***Peter Zamarovský*** *Peter Zamarovský (Gar.)*	KZ	4	2P+2S	Z	v
B0B16HTE	**History of technology and economic** *Marcela Efmertová, Jan Mikeš* ***Marcela Efmertová*** *Marcela Efmertová (Gar.)*	ZK	2	2P+0S	Z,L	v
B0B16HT1	**History of science and technology 1** *Marcela Efmertová, Jan Mikeš* ***Marcela Efmertová*** *Marcela Efmertová (Gar.)*	KZ	4	2P+2S	Z	v
B0B16HI1	**History 1** *Milena Josefovičová* ***Milena Josefovičová*** *Milena Josefovičová (Gar.)*	KZ	4	2P+2S	Z	v
B0B16MPS	**Psychology** *Jan Fiala* ***Jan Fiala*** *Jan Fiala (Gar.)*	Z,ZK	4	2P+2S	Z,L	v
B0B16MPL	**Psychology for managers** *Jan Fiala* ***Jan Fiala*** *Jan Fiala (Gar.)*	ZK	2	2P+0S	Z,L	v

Characteristics of the courses of this group of Study Plan: Code=2018_BBIOH Name=Humanities subjects

B0B16ET1	Ethic 1	KZ	4
Aim of this subject is to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situations of human life. Essential parts of the subject are discussions in which students can react to lectures but also to actual questions coming with news and look for the communal answers.			
B0B16FIL	Philosophy	ZK	2
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.			
B0B16FI1	Philosophy 1	KZ	4
We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.			
B0B16HTE	History of technology and economic	ZK	2
B0B16HT1	History of science and technology 1	KZ	4
B0B16HI1	History 1	KZ	4
B0B16MPS	Psychology	Z,ZK	4
B0B16MPL	Psychology for managers	ZK	2

Code of the group: 2015_BJKA
Name of the group: English language courses
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
Note on the group:

Code	Name of the course / Name of the group of courses *(in case of groups of courses the list of codes of their members)* *Tutors,* ***authors*** *and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
B0B04A21	**English Language A2-1** ***Dana Saláková***	Z		2s	Z	v
B0B04A22	**English Language A2-2** ***Dana Saláková***	Z	0	2s	L	v
B0B04B11	**English Language B1-1** ***Petra Juna Jennings*** *Petra Juna Jennings (Gar.)*	Z	0	2C	Z	v
B0B04B12	**English Language B1-2** ***Petra Juna Jennings*** *Petra Juna Jennings (Gar.)*	Z	0	2C	L	v
B0B04B21	**English Language B2-1** ***Petra Juna Jennings*** *Petra Juna Jennings (Gar.)*	Z	3	2C	Z	v
B0B04B22	**English Language B2-2** ***Petra Juna Jennings*** *Petra Juna Jennings (Gar.)*	Z	3	2C	Z,L	v

Characteristics of the courses of this group of Study Plan: Code=2015_BJKA Name=English language courses

B0B04A21	English Language A2-1	Z	
The course is open to students who are beginners in their second language. Course objective: Achieving competence in basic English.			
B0B04A22	English Language A2-2	Z	0
The course is open to students who are beginners in their second foreign language. The course objective is to develop and sustain their basic knowledge of the English language.			
B0B04B11	English Language B1-1	Z	0
Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.			
B0B04B12	English Language B1-2	Z	0
Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.			
B0B04B21	English Language B2-1	Z	3
This course is designed as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2 - zkouška - B0B04B2Z*). While the course is focused on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark), it also focuses more on the academic and technical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate level of English for Erasmus / International Study.			
B0B04B22	English Language B2-2	Z	3
This course is designed as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2 - zkouška - B0B04B2Z *). While the course is focused on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark), it also focuses more on the academic and technical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate level of English for Erasmus / International Study.			

Code of the group: 2018_BBIOVOL
Name of the group: Elective subjects
Requirement credits in the group:
Requirement courses in the group:
Credits in the group: 0
Note on the group: ~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách http://www.fel.cvut.cz/cz/education/volitelne-predmety.html\\

List of courses of this pass:

Code	Name of the course	Completion	Credits
2241050	Biomechanics for Bachelors	Z,ZK	4
B0B01DRN	Differencial Equations and Numerical Analysis	Z,ZK	4
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.			
B0B01KAN	Complex Analysis	Z,ZK	5
The course is an introduction to the fundamentals of complex analysis and its applications. The basic principles of Fourier, Laplace, and Z-transform are explained, including their applications, particularly to solving differential and difference equations.			
B0B01LAGA	Linear Algebra	Z,ZK	7
The course covers introductory topics of linear algebra. It begins with fundamental concepts related to vector spaces and linear transform (such as linear dependence and independence of vectors, bases, coordinates of vectors, etc.). The next part of the course is devoted to matrix theory (determinants, inverse matrix, matrices of linear transformation, eigenvalues and eigenvectors). Applications include solving systems of linear equations, geometry in three-dimensional space (including dot and cross products), and the singular value decomposition of a matrix.			
B0B01LGR	Logic and Graphs	Z,ZK	5
This course covers basics of mathematical logic and graph theory. Syntax and semantics of propositional and predicate logic are introduced. The importance of the notion of consequence and of the relationship between a formula and its model is stressed. Further, basic notions from graph theory are introduced.			
B0B01MA1A	Mathematical Analysis 1	Z,ZK	6
This is an introductory course to differential and integral calculus of functions of one real variable.			
B0B01MA2	Mathematical Analysis 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.			
B0B01STP	Statistics and Probability	Z,ZK	5
The aim of the course is to introduce students to the fundamentals of probability theory and mathematical statistics, their computational methods as well as applications of these mathematical tools to practical examples.			
B0B02UAK	Introduction to Acoustic	KZ	4
The subject provides overview of main parts of acoustics. In first lectures there is introduction to basic types of sound fields, its solutions and properties. Next chapter deals with introduction to building and room acoustics. The second half of the course deals with introductions to physiological acoustics, psychoacoustics, musical acoustics, hygiene legislation and ultrasound, infrasound and their measurement.			
B0B04A21	English Language A2-1	Z	
The course is open to students who are beginners in their second language. Course objective: Achieving competence in basic English.			
B0B04A22	English Language A2-2	Z	0
The course is open to students who are beginners in their second foreign language. The course objective is to develop and sustain their basic knowledge of the English language.			

B0B04B11	English Language B1-1	Z	0
Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.			
B0B04B12	English Language B1-2	Z	0
Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.			
B0B04B1K	English language B1 - classified assessment	KZ	0
verifying of the student´s skills of B1 level			
B0B04B21	English Language B2-1	Z	3
This course is designed as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2 - zkouška - B0B04B2Z*). While the course is focused on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark), it also focuses more on the academic and technical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate level of English for Erasmus / International Study.			
B0B04B22	English Language B2-2	Z	3
This course is designed as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2 - zkouška - B0B04B2Z *). While the course is focused on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark), it also focuses more on the academic and technical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate level of English for Erasmus / International Study.			
B0B04B2Z	English language B2 - exam	Z,ZK	0
I) The B2 English Exam is a compulsory subject for all Faculty of Electrical Engineering students at the Czech Technical University. According to the Study and Examination Rules and Regulations for Students at CTU (Part III, Article 4), a compulsory subject is one whose completion is a necessary condition in order to successfully complete the study programme. In addition, this requires the passing of an examination evaluated on the scale A, B, C, D, or E (SERR Part III, Article 6). II) According to the Common European Framework of Reference for Languages (CEFR), an international standard for describing language ability, the definition of an English language learner who has achieved the B2 (Upper-Intermediate) level is one who can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options. III) Students who have successfully passed an approved international exam within the past five years may present their certificate to the Department of Languages, Faculty of Electrical Engineering. Upon approval, students are then exempt from both the Written Test and the Oral Part. For a list of approved international exams go to the department website: http://jazyky.fel.cvut.cz/			
B0B16ET1	Ethic 1	KZ	4
Aim of this subject is to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situations of human life. Essential parts of the subject are discussions in which students can react to lectures but also to actual questions coming with news and look for the communal answers.			
B0B16FI1	Philosophy 1	KZ	4
We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.			
B0B16FIL	Philosophy	ZK	2
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.			
B0B16HI1	History 1	KZ	4
B0B16HT1	History of science and technology 1	KZ	4
B0B16HTE	History of technology and economic	ZK	2
B0B16MPL	Psychology for managers	ZK	2
B0B16MPS	Psychology	Z,ZK	4
B0B33OPT	Optimization	Z,ZK	7
The course provides an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated with a number of examples. You will refresh and extend many topics that you know from linear algebra and calculus courses.			
B0B36DBS	Database Systems	Z,ZK	6
The course is designed as a basic database course mainly aimed at the student ability to design a relational data model and to use the SQL language for data definition as well as for data querying and to choose the appropriate degree of transaction isolation. Students will also get acquainted with the most commonly used indexing techniques, database system architecture and their management. They will verify their knowledge during the elaboration of a continuously submitted seminar task.			
B2B15UELA	Introduction to Electrical Engineering	KZ	4
The course expands students knowledge of topics in power engineering. It provides a basic overview of the electricity production, transmission, distribution, and consumption chain, introduces the principles of electrical machines, and broadens understanding of materials used in electrical engineering.			
B2B17TBK	Wireless Communication Technique	KZ	4
Wireless communications belong to the fastest developing technical fields. Besides widely used mobile telephony systems, this field also includes many other both mobile and stationary communicating systems. Different types of radio modems are also built in the majority of electronic devices like PCs, tablets, notebooks, cameras, etc. With expected fast development of Internet of Things, operation of billions of wireless sensors is expected. The subject is common to all students of the Electronics and Communication study program, its main purpose is to teach all important aspects of this technical branch. Obtained knowledge should enable the students to design, project, adjust or manufacture any wireless communication system or its components. Besides wireless system analysis, the lectures include review of physical backgrounds, survey of the most important existing radio systems together with corresponding operational frequencies, description of electromagnetic wave propagation and related antennas. Instructions concerning propagation also cover behavior of EM waves in an urban environment or inside buildings. Lectures concerning analysis of typical wireless systems also cover description of related radio-frequency, microwave and mm-wave circuits and components. Exercises include practical calculations of wireless systems, computer analysis and synthesis of important structures and circuits, and related laboratory measurements.			
B2B31EO1	Electronic Circuits 1	Z,ZK	4
The course introduces basic circuits with operational amplifiers, continues with the description of linear systems, analysis of their characteristics and fundamentals of synthesis frequency filters. It deals with the principles and features of circuits for generating signals and a controlled oscillator including the PLL circuit and its use. The last part of the course is devoted to basic amplifier stages with transistors.			
B2B31EO2	Electronic Circuits 2	Z,ZK	4
The course builds on the basic electric circuits course. It introduces multistage transistor amplifiers and basic applications in the field of electronic systems. Students become familiar with design and measurement of electronic systems, including nonlinear applications with regard to the real characteristics of operational amplifiers. Next operating principles and parameters of power amplifiers, linear stabilizers, switching power supply and D/A and A/D converters are presents.			

B2B31ZEOA	Fundamentals of Electric Circuits	Z,ZK	5
The course describes the basic methods of analysis of electrical circuits. In the lectures, students are introduced to the basic active and passive circuit elements, circuit quantities, important circuit theorems and methods of circuit analysis in stationary and harmonic steady state as well as during transients caused by changes in the circuit. The seminars are aimed at practicing knowledge in the analysis of basic electrical circuits, supplemented by simulations and simple measurements.			
B2B34MIK	Microcontrollers	Z,ZK	4
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 applications and measure actual properties. Because of usage of a programming language C it will be possible to focus on the practical part of the realization.			
B2B37SAS	Signals and systems	Z,ZK	5
Introductory course focused on a description of continuous- and discrete-time signals and systems in time and frequency domains. The course also introduces the basic characteristics of bandpass signals, analog modulations and random signals.			
B2B38EMBA	Electrical Measurements	Z,ZK	5
Methods of measurement of electrical 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 on several basic electronic measuring instruments and explaining the fundamentals of magnetic measurements and basic information concerning measurement systems.			
B3B02FY1A	Physics 1	Z,ZK	7
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.			
B3B02FY2	Physics 2	Z,ZK	6
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.			
B3B33ALP	Algorithms and Programming	Z,ZK	6
This subject will give students a basic understanding of algorithms and programming and teach them to design, implement and test algorithms for simple tasks. The students will understand the notion of computational complexity. They will learn about basic program building blocks such as loops, conditional statements, variables, functions and recursion. We will introduce the most often used data structures (queue, stack, list, array etc) and operations on them. We will show the basic algorithms, for example for searching and sorting. Students will learn to write simple programs in Python.			
B3B33KUI	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.			
B3B33LAR	Laboratory of robotics	KZ	4
During this laboratory courses the students are introduced with the practical robotics through solving of practical tasks. Students are working in laboratories in groups which consist of 3 or 4 members. During the semester, each group of students jointly solve one practical problem in the field of robotics. Tasks are designed to introduce students with robotics (manipulators and mobile robots). The students should utilize the basic knowledge obtained in previous study (eg. mathematics, physics, electronics, software development). Students can select specific task from few tasks with different specialization, which are announced each semester. Tasks differs between semesters. An integral part of the solution of the problem is cooperation and communication in the student team.			
B3B33ROB	Robotics	Z,ZK	5
The course is an introduction into industrial robotics with the emphasis on the industrial robots and manipulators. The robot kinematics is thoroughly studied. The student shall be able to choose, design, and program industrial robot and integrate it into the robotic cell after passing the course.			
B3B38LPE	Laboratories of Industrial Electronics and Sensors	KZ	4
The objective of the "Laboratories" is to introduce students in a playful and interactive way with basic blocks of an industrial sensor system - from the sensor itself, through signal processing circuits, analog to digital signal conversion, software processing by a microcontroller up to the sending of the results to the superior system or database and their presentation to the user within the concept "Internet of Things".			
B4B01NUM	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 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.			
B4B33ALG	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 Java. 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 effectivity.			
B4B33RPZ	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.			
B4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6
The aim of the course is to cover the basics of symbolic artificial intelligence. We will focus on algorithms of informed and uninformed state space search, problem representation and solving, representation of knowledge using formal logic, methods of automated reasoning, and an introduction to Markov decision making, and to two-player games. 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.			
B4B38NVS	Embedded Systems Design	Z,ZK	6
The course deals with design of embedded systems using ARM based microcontrollers.			
B4M33DZO	Digital image	Z,ZK	6
This course presents an overview of basic methods for digital image processing. It deals with practical techniques that have an interesting theoretical basis but are not difficult to implement. Seemingly abstract concepts from mathematical analysis, probability theory, or optimization come to life through visually engaging applications. The course focuses on			

fundamental principles (signal sampling and reconstruction, monadic operations, histogram, Fourier transform, convolution, linear and non-linear filtering) and more advanced editing techniques, including image stitching, deformation, registration, and segmentation. Students will practice the selected topics through six implementation tasks, which will help them learn the theoretical knowledge from the lectures and use it to solve practical problems

BAB02BFY	Biophysics	Z,ZK	4

The course is focused on physical processes associated with blood flow and blood gas exchange, including description of events on biological membranes. Further, the possibilities of measuring advanced hemodynamic parameters of the bloodstream are discussed. A large space is devoted to the problems of hemodialysis and peritoneal dialysis. In the second part of the semester students are acquainted with the properties of human tissue and body fluids, including methods of their measurement. This knowledge is complemented by the basics of optics and acoustics, always in relation to biological systems. Part of the course are laboratory exercises in a modern laboratory, which suitably complement the theoretical knowledge of students from lectures.

BAB02CHE	Chemistry for Bioengineering	Z,ZK	3

Students will learn the basic areas of applied chemistry in biomedical engineering and technology. At the same time, this course will introduce other chemical disciplines. During laboratory exercises, students should acquire basic laboratory techniques used in chemical laboratories focused primarily on the analysis of substances and materials. Laboratory exercises are preceded by exercises focused on practical calculations for laboratory practice.

BAB17EMP	Electromagnetic Field	Z,ZK	5

This course gets its students acquinted with principles and applied electromagnetic field theory basics.

BAB31AF1	Fundamentals of Anatomy and Physiology I	KZ	4

This theoretical and practical course introduces students to professional anatomical terminology while providing them with basic knowledge of human anatomy and physiology.

BAB31AF2	Fundamentals of Anatomy and Physiology II	Z,ZK	4

The course introduces the functions of the individual organ systems of the human body under resting and stress conditions. Special attention is paid to transport systems and the regulation of homeostasis. The basic possibilities of examination of these systems are presented.

BAB31GEN	Genetics	ZK	3

The subject provides students of technical dsciplines with basic information about genetics with an emphasis on modern genetic disciplines and knowledge that is closely related to the issue of medical electronics and especially bioinformatics. The focus is on the organization and function of the human genome, including its possible pathologically significant changes and the techniques used to determine them. Students will also learn basic information about clinical genetics, genetic counseling, genetic testing, as well as their possible ethical and legal issues. The conclusion of the course also deals with original and modern approaches enabling targeted editing of the genome, especially the so-called gene therapy. Although the majority of the curriculum is oriented towards the human organism, knowledge about the genetics of other living systems - especially prokaryotes and viruses - is part of the teaching.

BAB31UBI	Introduction to bioengineering	KZ	4

The course presents the basics of biomedical engineering and provides illustrative examples of projects performed by the faculty teams.

BAB31ZZS	Basic Signal Processing	KZ	4

An introductory course on digital signal processing (DSP). The course introduces the basic digital signals theory with an emphasis on practical applications and analysis of real signals in time. Exercises are built for progressive mastery of the MATLAB programming environment, which provides a friendly and easy-to-use user environment with graphical and audio output. You will apply the acquired knowledge in other courses, projects, theses, and especially in broader engineering and biomedical practice.

BAB34BMS	Biomedical sensors	Z,ZK	4

Sensors and microsensors used in biomedicine. Physical principles of operation of sensors and microsensors for sensing: temperature, pressure, deformation, vibration, mechanical quantities, magnetic field, flow, chemical and biochemical quantities, etc. Classification, parameters. Processing of sensor signals, application of sensors in biomedicine. Nanotechnology. Sensors and microsystems for biomedical diagnostics (Lab-on-chip, etc.).

BAB34BSP	Biomedical Sensors Practically	KZ	4

The aim of the course is to gain experience with design, implementation and testing of practical constructions with sensors for biomedical applications and with regard to the needs of students of FEE who will realize the practical final work.

BAB34MNS		Z,ZK	4

The content of the course are knowledge of new principles of operation of components and systems with micro-dimensions, microsystems, microsensors and microactuators usable in biomedicine, microsurgery, etc. The course points to new possibilities of implementation and application of integrated microcomponents working with various physical and biochemical principles and quantities using mainly MEMS technology. Physical principles of operation of microsystems and microactuators, classification, parameters, design, integration, signal processing, linearization, calibration, system intelligence, applications of microactuators (electrostatic, piezoelectric, thermal, chemical and biochemical, optical, ..). The course introduces modern solutions in biomedicine, action elements in conjunction with sensors, whose operation is based on basic physical and biochemical principles, including basic applications in micromanipulation, microrobots. The course presents the principles of touch screens, energy microgenerators.

BAB36PRGA	Programming in C	Z,ZK	6

The course targets to gain a deep, comprehensive knowledge of the C programming language in terms of program operation, access and memory management, and the development of multi-threaded applications. The course emphasizes acquiring programming habits for creating readable and reusable programs. Students get acquainted with the compilation of the source codes and their debugging. Lectures are based on the presentation of basic software constructs and demonstration of motivational programs with practical constructs pointing to the readability and structure of source code, real computational complexity, and related tools for profiling and debugging. Students get acquainted with the principles of parallel programming of multi-threaded applications, synchronization mechanisms, and models of multi-threaded applications. At the end of the semester, the basic features of the object-oriented C ++ extension are briefly presented.

BAB37APO	Applied Optics	Z,ZK	4
BAB37ZPR	Programming Essentials	Z,ZK	6
BBAP20	Bachelor thesis	Z	20
BBPROJ4	Bachelor Project	Z	4

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