

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: 156

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	Z	20	0+12	L,Z	P

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

BBAP20	Bachelor thesis				Z	20
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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	P
B0B16FIL	Philosophy Peter Zamarovský Peter Zamarovský (Gar.)	ZK	2	2P+0S	Z,L	P
B0B16FI1	Philosophy 1 Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.)	KZ	4	2P+2S	Z	P
B0B16HI1	History 1 Roman Elner, Milena Josefovičová Milena Josefovičová Milena Josefovičová (Gar.)	KZ	4	2P+2S	Z	P
B0B16HTE	History of technology and economic Marcela Efmertová, Jan Mikeš Marcela Efmertová Marcela Efmertová (Gar.)	ZK	2	2P+0S	Z,L	P
B0B16HT1	History of science and technology 1 Marcela Efmertová, Jan Mikeš Jan Mikeš Marcela Efmertová (Gar.)	KZ	4	2P+2S	Z	P
B0B16MPS	Psychology Jan Fiala Jan Fiala Jan Fiala (Gar.)	Z,ZK	4	2P+2S	Z,L	P
B0B16MPL	Psychology for managers Jan Fiala Jan Fiala Jan Fiala (Gar.)	ZK	2	2P+0S	Z,L	P

A003TV	Physical Education	Z	2	0+2	L,Z	P
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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.			
B0B16F11	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.			
B0B16HI1	History 1	KZ	4
B0B16HTE	History of technology and economic	ZK	2
B0B16HT1	History of science and technology 1	KZ	4
B0B16MPS	Psychology	Z,ZK	4
B0B16MPL	Psychology for managers	ZK	2
A003TV	Physical Education	Z	2

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 136 credits

Requirement courses in the group: In this group you have to complete 27 courses

Credits in the group: 136

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 Alexandr Laposá, Miroslav Husák, Adam Bouřa Miroslav Husák Miroslav Husák (Gar.)	Z,ZK	4	2P+2L	L	P
BAB02CHE	Chemistry for Bioengineering Ivana Pilarčíková Ivana Pilarčíková Ivana Pilarčíková (Gar.)	Z,ZK	3	2P+1L		P
B0B01DRN	Differential Equations and Numerical Analysis Petr Habala, Aleš Němeček, Veronika Sobotíková, Karel Pospíšil Petr Habala Petr Habala (Gar.)	Z,ZK	4	2P+2C	L	P
B4M33DZO	Digital image Václav Hlaváč Václav Hlaváč Václav Hlaváč (Gar.)	Z,ZK	6	2P+2C	Z	P
B1B38EMA	Electrical Measurements Jakub Svatoš, Petr Kašpar Petr Kašpar Petr Kašpar (Gar.)	KZ	5	2P+2L	L	P
B1B17EMP	Electromagnetic Field Vítězslav Pankrác Vítězslav Pankrác Vítězslav Pankrác (Gar.)	Z,ZK	5	2P+2C	Z	P
B2B31EO1	Electronic Circuits 1 Jiří Hospodka, Jiří Náhlík Jiří Hospodka Jiří Hospodka (Gar.)	Z,ZK	4	2P+2L	Z,L	P
B3B02FY1	Physics 1 Michal Bednařík, Petr Koníček Michal Bednařík Petr Koníček (Gar.)	Z,ZK	6	4P+1L+2C	L	P
B3B02FY2	Physics 2 Jaroslav Jíra, Michal Bednařík, Petr Koníček, Jan Koller 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 Martin Bohata, Jan Hamhalter Martin Bohata Jan Hamhalter (Gar.)	Z,ZK	5	2P+2S	Z	P
B0B01LAGA	Linear Algebra Jiří Velebil, Kateřina Helisová, Natalie Žukovec, Matěj Dostál, Paola Víví Jiří Velebil Jiří Velebil (Gar.)	Z,ZK	7	4P+2S	Z	P
B0B01MA1A	Mathematical Analysis 1 Veronika Sobotíková, Karel Pospíšil, Michal Hroch, Anna Kalousová, Josef Hekrdla Veronika Sobotíková Veronika Sobotíková (Gar.)	Z,ZK	6	4P+2S	Z,L	P
B0B01MA2	Mathematical Analysis 2 Natalie Žukovec, Paola Víví, Josef Hekrdla, Petr Hájek, Jaroslav Tíšer, Miroslav Korbelář, Matěj Novotný Petr Hájek Jaroslav Tíšer (Gar.)	Z,ZK	7	4P+2S	L,Z	P
B0B33OPT	Optimization Tomáš Kroupa, Tomáš Werner, Petr Olšák Tomáš Kroupa 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	Z	4	4s	Z,L	P
B4B33RPZ	Recognition and machine learning <i>Ondřej Drbohlav, Jiří Matas Ondřej Drbohlav Jiří Matas (Gar.)</i>	Z,ZK	6	2P+2C	Z	P
B2B37SAS	Signals and systems <i>Karel Fliegel, Pavel Puričar Karel Fliegel Karel Fliegel (Gar.)</i>	Z,ZK	5	2P+2C	L	P
B0B01STP	Statistics and Probability <i>Kateřina Helisová, Miroslav Korbelář Kateřina Helisová Kateřina Helisová (Gar.)</i>	Z,ZK	5	2P+2S	L	P
BAB31AF1	Fundamentals of anatomy and physiology I. <i>Václav Kvítek Václav Kvítek Václav Kvítek (Gar.)</i>	KZ	4	2P+2L	Z	P
BAB31AF2	Fundamentals of anatomy and physiology II. <i>Václav Kvítek Václav Kvítek Václav Kvítek (Gar.)</i>	Z,ZK	4	2P+2L	L	P
B2B31ZEO	Fundamentals of Electric Circuits <i>Jiří Náhlík, Pavel Máša, Roman Čmejla, Martin Pokorný, Jan Havlík Roman Čmejla Roman Čmejla (Gar.)</i>	Z,ZK	6	2P+2L	L	P
BAB37ZPR	Programming Essentials <i>Stanislav Vítek Stanislav Vítek Stanislav Vítek (Gar.)</i>	Z,ZK	6	2P+2C	Z	P
A0B31ZZS	Multimedia signal synthesis <i>Radek Janča Roman Čmejla Roman Čmejla (Gar.)</i>	Z,ZK	4	2P+2C	Z	P
B2B15UELA	Introduction to Electrical Engineering <i>Zdeněk Müller, Pavel Hrzina Pavel Hrzina Zdeněk Müller (Gar.)</i>	KZ	4	2P+1L	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
BAB34BMS	Biomedical sensors	Z,ZK	4
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	Differential Equations and Numerical Analysis	Z,ZK	4
B4M33DZO	Digital image	Z,ZK	6
The subject teaches how to represent the two-dimensional image in a computer, how to process it and interpret it. The first part of the subject deals with the image as with the signal without interpretation. Image acquisition, linear and nonlinear preprocessing methods and image compression will be explicated. In the second part, image segmentation and registration methods will be taught. Studied topics will be practiced on practical examples in order to obtain also practical skills.			
B1B38EMA	Electrical Measurements	KZ	5
B1B17EMP	Electromagnetic Field	Z,ZK	5
This course gets its students acquainted 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.			
B3B02FY1	Physics 1	Z,ZK	6
The basic course of physics at the Faculty of Electrical Engineering - Physics 1, is devoted to the introduction into two important areas of physics. The first one is a classical mechanics and the second one is the electric and magnetic field. Within the framework of the classical mechanics, the students study the particle kinematics; dynamics of the mass particle, system of mass particles and rigid bodies. The students should be able to solve basic problems dealing with the description of mechanical systems, which they can meet during their further studies. The classical mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The students can use the facts gained in this course in the study of electrical circuits, theory of electrotechnical materials or radioelectronics. Apart of this, the knowledge gained in this course is required for the study of the consecutive course Physics 2.			
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
B0B01KAN	Complex Analysis	Z,ZK	5
B0B01LAGA	Linear Algebra	Z,ZK	7
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 the basics of mathematical optimization: using linear algebra for optimization (least squares, SVD), Lagrange multipliers, selected numerical algorithms (gradient, Newton, Gauss-Newton, Levenberg-Marquardt methods), linear programming, convex sets and functions, intro to convex optimization, duality.			
BAB36PRGA	Programming in C	Z,ZK	6
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.			

B2B37SAS	Signals and systems 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.	Z,ZK	5
B0B01STP	Statistics and Probability	Z,ZK	5
BAB31AF1	Fundamentals of anatomy and physiology I.	KZ	4
BAB31AF2	Fundamentals of anatomy and physiology II.	Z,ZK	4
B2B31ZEO	Fundamentals of Electric Circuits	Z,ZK	6
BAB37ZPR	Programming Essentials	Z,ZK	6
A0B31ZZS	Multimedia signal synthesis The introductory subject to the study of Digital Signal Processing. The main emphasis is focused on the interpretation and acquirement of the basic principals. Practical approaches and real examples from different areas (music, biomedical engineering, speech processing communication systems) are used. The program system MATLAB is used for the tasks solution, which offers comfortable and user friendly environment with graphical and sound outputs and allows digital signal processing in different formats.	Z,ZK	4
B2B15UELA	Introduction to Electrical Engineering	KZ	4

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 Dana Saláková, Markéta Havlíčková Pavla Péterová Dana Saláková (Gar.)	KZ	0	0C	Z,L	P
B0B04B2Z	English language B2 - exam Dana Saláková, Markéta Havlíčková, Pavla Péterová, Petra Jennings, Michael Ynsua Pavla Péterová Dana Saláková (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 verifying of the student's skills of B1 level	KZ	0
B0B04B2Z	English language B2 - exam B2 Common European Framework: 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. Grammar and Vocabulary: word families, verb-noun collocations, complex noun phrases, countable and uncountable nouns, prefixes, it-clauses, reporting verbs, questions, modal verbs, conjunctions and sentence connectors, articles, prepositions, wh-noun clauses, relative clauses, if-clauses, passive voice, past perfect, -ing nouns Listening: picking up information, transferring information Reading: A technical text is presented. Students are required to show understanding the concept and vocabularies. Writing: Emphasis is put on the expression of ideas in the independent writing of paragraphs and short essays. Students should be able to present a short basic argument in written English. Oral Skills: Students are supposed to use the language independently and effectively in all situations giving their own opinions and defending their ideas and beliefs. A mixture of research and development, career oriented and general topics is presented. Examination: The examination consists of two parts: a) Written test ? based on grammar and lexicology, NOT TAKEN by the students whose success rate in both the summer semester tests (Midterm and Final) is above 80%. The written test is followed by the oral part. b) Oral part ? reading a technical text with understanding (study reading techniques ? skimming and scanning, comprehension and discussion questions based on the text, translation), oral interaction, comprehending the content of the spoken message.	Z,ZK	0

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 14

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 63)

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-Berezovskij, Daniel Průša Daniel Průša Marko Genyk-Berezovskij (Gar.)	Z,ZK	6	2P+2C	Z	PV
BAB37APO	Applied Optics Petr Páta, Jan Bednář Jan Bednář Petr Páta (Gar.)	Z,ZK	4	2P+2L	L	PV

B0B36DBS	Database Systems <i>Martin Svoboda</i>	Z,ZK	6	2P+2C	L	PV
B2B31EO2	Electronic Circuits 2 <i>Jiří Hospodka Jiří Hospodka Jiří Hospodka (Gar.)</i>	Z,ZK	4	2P+2L	Z	PV
B3B38LPE	Laboratories of Industrial Electronics and Sensors <i>Vojtěch Petrucha Vojtěch Petrucha Vojtěch Petrucha (Gar.)</i>	KZ	4	0P+4L	L	PV
B0B35LSP	Logic systems and processors <i>Richard Šusta Richard Šusta (Gar.)</i>	Z,ZK	6	3P+2L	Z,L	PV
B0B01LGR	Logic and Graphs <i>Matěj Dostál, Anna Kalousová, Alena Gollová Matěj Dostál Marie Demlová (Gar.)</i>	Z,ZK	5	3P+2S	Z,L	PV
B2B34MIK	Microcontrollers <i>Tomáš Teplý, Vladimír Janíček Tomáš Teplý Vladimír Janíček (Gar.)</i>	Z,ZK	4	2P+2C	Z	PV
B4B01NUM	Numerical Analysis <i>Aleš Němeček, Mirko Navara Aleš Němeček Mirko Navara (Gar.)</i>	Z,ZK	6	2P+2C	Z	PV
B4B38NVS	Embedded Systems Design <i>Vojtěch Petrucha, Jan Fischer Jan Fischer Jan Fischer (Gar.)</i>	Z,ZK	6	2P+2L	Z	PV
B2B32STE	Network Technologies <i>Pavel Bezpálec, Leoš Boháč Ján Kučerák Leoš Boháč (Gar.)</i>	Z,ZK	4	2P + 2C	Z	PV
B2B17TBK	Wireless Communication Technique <i>Přemysl Hudec, Pavel Pechač, Tomáš Kořínek Přemysl Hudec Přemysl Hudec (Gar.)</i>	KZ	4	2P+2L	L	PV
B0B02UAK	Introduction to Acoustic <i>Marek Brothánek, Ondřej Jiříček Ondřej Jiříček Ondřej Jiříček (Gar.)</i>	KZ	4	2P+2L	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			
B0B36DBS	Database Systems	Z,ZK	6			
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.		
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".		
B0B35LSP	Logic systems and processors	Z,ZK	6	The course is an introduction to basic hardware structures of computing resources, their design, and architecture. It provides an overview of the implementation of data operations at hardware and the creation of embedded processor systems with peripherals on advance programmable logic FPGAs.		
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 semantic consequence and of the relationship between a formula and its model is stressed, Further, basic notions from graph theory are introduced.		
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.		
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.		
B4B38NVS	Embedded Systems Design	Z,ZK	6	The course deals with design of embedded systems using ARM based microcontrollers.		
B2B32STE	Network Technologies	Z,ZK	4	The primary task of this subject is to move further already acquired fundamental networking knowledge in the context of Data Networks subject. Students will comprehend working principles of various methods to access common shared physical media, Ethernet switching technologies and WiFi networks and last but not least they will also master an essential networking theory as used in real practice. Students will be given a chance to get in touch with technology to implement simple routed and switched networks in the university network lab.		
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.		

Name of the block: Elective courses

Minimal number of credits of the block: 0

The role of the block: V

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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
B0B04A21	English Language A2-1 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z		2s	Z	v
B0B04A22	English Language A2-2 <i>Markéta Havlíčková</i>	Z	0	2s	L	v
B0B04B11	English Language B1-1 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	0	2s	Z	v
B0B04B12	English Language B1-2 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	0	2C	L	v
B0B04B21	English Language B2-1 <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	3	2C	Z	v
B0B04B22	English Language B2-2 <i>Pavla Péterová Dana Saláková (Gar.)</i>	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
The course is suitable for students who have good knowledge of the material covered in secondary school in that language. Course objective: The course focuses on technical English and practising difficult grammar concepts.			
B0B04B22	English Language B2-2	Z	3
The course is suitable for students who have good knowledge of the material covered in secondary school. Course objective: The course focuses on technical English and practising difficult grammar.			

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
A003TV	Physical Education	Z	2
A0B31ZZS	Multimedia signal synthesis	Z,ZK	4
The introductory subject to the study of Digital Signal Processing. The main emphasis is focused on the interpretation and acquirement of the basic principals. Practical approaches and real examples from different areas (music, biomedical engineering, speech processing communication systems) are used. The program system MATLAB is used for the tasks solution, which offers comfortable and user friendly environment with graphical and sound outputs and allows digital signal processing in different formats.			

B0B01DRN	Differential Equations and Numerical Analysis	Z,ZK	4
B0B01KAN	Complex Analysis	Z,ZK	5
B0B01LAGA	Linear Algebra	Z,ZK	7
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 semantic 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 This is an introductory course to differential and integral calculus of functions of one real variable.	Z,ZK	6
B0B01MA2	Mathematical Analysis 2 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.	Z,ZK	7
B0B01STP	Statistics and Probability	Z,ZK	5
B0B02UAK	Introduction to Acoustic 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.	KZ	4
B0B04A21	English Language A2-1 The course is open to students who are beginners in their second language. Course objective: Achieving competence in basic English.	Z	
B0B04A22	English Language A2-2 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.	Z	0
B0B04B11	English Language B1-1 Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.	Z	0
B0B04B12	English Language B1-2 Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.	Z	0
B0B04B1K	English language B1 - classified assessment verifying of the student's skills of B1 level	KZ	0
B0B04B21	English Language B2-1 The course is suitable for students who have good knowledge of the material covered in secondary school in that language. Course objective: The course focuses on technical English and practising difficult grammar concepts.	Z	3
B0B04B22	English Language B2-2 The course is suitable for students who have good knowledge of the material covered in secondary school. Course objective: The course focuses on technical English and practising difficult grammar.	Z	3
B0B04B2Z	English language B2 - exam B2 Common European Framework: 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. Grammar and Vocabulary: word families, verb-noun collocations, complex noun phrases, countable and uncountable nouns, prefixes, it-clauses, reporting verbs, questions, modal verbs, conjunctions and sentence connectors, articles, prepositions, wh-noun clauses, relative clauses, if-clauses, passive voice, past perfect, -ing nouns Listening: picking up information, transferring information Reading: A technical text is presented. Students are required to show understanding the concept and vocabularies. Writing: Emphasis is put on the expression of ideas in the independent writing of paragraphs and short essays. Students should be able to present a short basic argument in written English. Oral Skills: Students are supposed to use the language independently and effectively in all situations giving their own opinions and defending their ideas and beliefs. A mixture of research and development, career oriented and general topics is presented. Examination: The examination consists of two parts: a) Written test ? based on grammar and lexicology, NOT TAKEN by the students whose success rate in both the summer semester tests (Midterm and Final) is above 80%. The written test is followed by the oral part. b) Oral part ? reading a technical text with understanding (study reading techniques ? skimming and scanning, comprehension and discussion questions based on the text, translation), oral interaction, comprehending the content of the spoken message.	Z,ZK	0
B0B16ET1	Ethic 1 Aim of this subject is to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situations of human life. Essential parts of the subject are discussions in which students can react to lectures but also to actual questions coming with news and look for the communal answers.	KZ	4
B0B16F11	Philosophy 1 We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.	KZ	4
B0B16FIL	Philosophy 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.	ZK	2
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 The course provides the basics of mathematical optimization: using linear algebra for optimization (least squares, SVD), Lagrange multipliers, selected numerical algorithms (gradient, Newton, Gauss-Newton, Levenberg-Marquardt methods), linear programming, convex sets and functions, intro to convex optimization, duality.	Z,ZK	7
B0B35LSP	Logic systems and processors The course is an introduction to basic hardware structures of computing resources, their design, and architecture. It provides an overview of the implementation of data operations at hardware and the creation of embedded processor systems with peripherals on advance programmable logic FPGAs.	Z,ZK	6
B0B36DBS	Database Systems	Z,ZK	6
B1B17EMP	Electromagnetic Field This course gets its students acquainted with principles and applied electromagnetic field theory basics.	Z,ZK	5
B1B38EMA	Electrical Measurements	KZ	5

B2B15UELA	Introduction to Electrical Engineering	KZ	4
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.			
B2B31ZEO	Fundamentals of Electric Circuits	Z,ZK	6
B2B32STE	Network Technologies	Z,ZK	4
The primary task of this subject is to move further already acquired fundamental networking knowledge in the context of Data Networks subject. Students will comprehend working principles of various methods to access common shared physical media, Ethernet switching technologies and WiFi networks and last but not least they will also master an essential networking theory as used in real practice. Students will be given a chance to get in touch with technology to implement simple routed and switched networks in the university network lab.			
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.			
B3B02FY1	Physics 1	Z,ZK	6
The basic course of physics at the Faculty of Electrical Engineering - Physics 1, is devoted to the introduction into two important areas of physics. The first one is a classical mechanics and the second one is the electric and magnetic field. Within the framework of the classical mechanics, the students study the particle kinematics; dynamics of the mass particle, system of mass particles and rigid bodies. The students should be able to solve basic problems dealing with the description of mechanical systems, which they can meet during their further studies. The classical mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The students can use the facts gained in this course in the study of electrical circuits, theory of electrotechnical materials or radioelectronics. Apart of this, the knowledge gained in this course is required for the study of the consecutive course Physics 2.			
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.			
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.			
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
The subject teaches how to represent the two-dimensional image in a computer, how to process it and interpret it. The first part of the subject deals with the image as with the signal without interpretation. Image acquisition, linear and nonlinear preprocessing methods and image compression will be explicated. In the second part, image segmentation and registration methods will be taught. Studied topics will be practiced on practical examples in order to obtain also practical skills.			
BAB02BFY	Biophysics	Z,ZK	4
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.			
BAB31AF1	Fundamentals of anatomy and physiology I.	KZ	4
BAB31AF2	Fundamentals of anatomy and physiology II.	Z,ZK	4

BAB31GEN	Genetics	ZK	3
BAB34BMS	Biomedical sensors	Z,ZK	4
BAB36PRGA	Programming in C	Z,ZK	6
BAB37APO	Applied Optics	Z,ZK	4
BAB37ZPR	Programming Essentials	Z,ZK	6
BBAP20	Bachelor thesis	Z	20
BBPROJ4	Bachelor project	Z	4

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

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