

Recommended pass through the study plan

Name of the pass: Medical electronics and bioinformatics - Passage through study

Faculty/Institute/Others: Faculty of Electrical Engineering

Department:

Pass through the study plan: Medical electronics and bioinformatics

Branch of study guaranteed by the department: Common courses

Guarantor of the study branch:

Program of study: Medical Electronics and Bioinformatics

Type of study: Bachelor full-time

Note on the pass:

Coding of roles of courses and groups of courses:

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

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

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

Number of semester: 1

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BEZB	Safety in Electrical Engineering for a bachelor's degree Vladimír Kůla, Ivana Nová, Radek Havlíček Vladimír Kůla Vladimír Kůla (Gar.)	Z	0	2BP+2BC	Z,L	P
B0B01LAGA	Linear Algebra Jiří Velebil, Kateřina Helisová, Natalie Žukovec, Matěj Dostál, Paola Vivi Jiří Velebil Jiří Velebil (Gar.)	Z,ZK	7	4P+2S	Z	P
B0B01MA1A	Mathematical Analysis 1 Karel Pospíšil, Veronika Sobotíková, Michal Hroch, Anna Kalousová, Josef Hekrdla Veronika Sobotíková Veronika Sobotíková (Gar.)	Z,ZK	6	4P+2S	Z,L	P
BEZZ	Basic health and occupational safety regulations Vladimír Kůla, Ivana Nová, Radek Havlíček Vladimír Kůla Vladimír Kůla (Gar.)	Z	0	2BP+2BC	Z	P
BAB31AF1	Fundamentals of anatomy and physiology I. Václav Kvítek Václav Kvítek Václav Kvítek (Gar.)	KZ	4	2P+2L	Z	P
BAB37ZPR	Programming Essentials Stanislav Vítek Stanislav Vítek Stanislav Vítek (Gar.)	Z,ZK	6	2P+2C	Z	P
B2B15UELA	Introduction to Electrical Engineering Zdeněk Müller, Pavel Hrzina Pavel Hrzina Zdeněk Müller (Gar.)	KZ	4	2P+1L	Z	P
2018_BBIOVOL	Volitelné odborné předměty	Min. cours. 0	Min/Max 0/999			V

Number of semester: 2

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
B0B01DRN	Diferencial Equations and Numerical Analysis Karel Pospíšil, Veronika Sobotíková, Petr Habala, Aleš Němeček Petr Habala Petr Habala (Gar.)	Z,ZK	4	2P+2C	L	P
B3B02FY1	Physics 1 Michal Bednařík, Petr Koníček Michal Bednařík Petr Koníček (Gar.)	Z,ZK	6	4P+1L+2C	L	P
B0B01MA2	Mathematical Analysis 2 Natalie Žukovec, Paola Vivi, Josef Hekrdla, Petr Hájek, Jaroslav Tišer, Miroslav Korbelař, Matěj Novotný Petr Hájek Jaroslav Tišer (Gar.)	Z,ZK	7	4P+2S	L,Z	P
BAB36PRGA	Programming in C Jan Faigl Jan Faigl Jan Faigl (Gar.)	Z,ZK	6	2P+2C	L	P
BAB31AF2	Fundamentals of anatomy and physiology II. Václav Kvítek Václav Kvítek Václav Kvítek (Gar.)	Z,ZK	4	2P+2L	L	P
B2B31ZEO	Fundamentals of Electric Circuits Pavel Máša, Roman Čmejla, Jiří Náhlík, Martin Pokorný, Jan Havlík Roman Čmejla Roman Čmejla (Gar.)	Z,ZK	6	2P+2L	L	P

Number of semester: 3

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BAB02CHE	Chemistry for Bioengineering Ivana Pilarčíková Ivana Pilarčíková Ivana Pilarčíková (Gar.)	Z,ZK	3	2P+1L		P
B1B17EMP	Electromagnetic Field Vítězslav Pankrác Vítězslav Pankrác Vítězslav Pankrác (Gar.)	Z,ZK	5	2P+2C	Z	P
B2B31EO1	Electronic Circuits 1 Jiří Náhlik, Jiří Hospodka Jiří Hospodka Jiří Hospodka (Gar.)	Z,ZK	4	2P+2L	Z,L	P
B3B02FY2	Physics 2 Michal Bednařík, Petr Koniček, Jaroslav Jíra, 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
A0B31ZZS	Multimedia signal synthesis Radek Janča Roman Čmejla Roman Čmejla (Gar.)	Z,ZK	4	2P+2C	Z	P

Number of semester: 4

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
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 Laposa, Miroslav Husák, Adam Bouřa Miroslav Husák Miroslav Husák (Gar.)	Z,ZK	4	2P+2L	L	P
B1B38EMA	Electrical Measurements Jakub Svatoš, Petr Kašpar Petr Kašpar Petr Kašpar (Gar.)	KZ	5	2P+2L	L	P
B2B37SAS	Signals and systems Karel Fliegel, Pavel Puričar Karel Fliegel Karel Fliegel (Gar.)	Z,ZK	5	2P+2C	L	P
B0B01STP	Statistics and Probability Kateřina Helisová, Miroslav Korbelař Kateřina Helisová Kateřina Helisová (Gar.)	Z,ZK	5	2P+2S	L	P
2018_BBIOPV	Povinně volitelné předměty B4B33ALG,BAB37APO,..... (see the list of groups below)	Min. cours. 3	Min/Max 14/63			PV

Number of semester: 5

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
B4M33DZO	Digital image Václav Hlaváč Václav Hlaváč Václav Hlaváč (Gar.)	Z,ZK	6	2P+2C	Z	P
B0B33OPT	Optimization Tomáš Kroupa, Tomáš Werner, Petr Olšák Tomáš Kroupa Tomáš Werner (Gar.)	Z,ZK	7	4P+2C	Z,L	P
BBPROJ4	Bachelor project	Z	4	4s	Z,L	P
B4B33RPZ	Recognition and machine learning Ondřej Drbohlav, Jiří Matas Ondřej Drbohlav Jiří Matas (Gar.)	Z,ZK	6	2P+2C	Z	P
2018_BBIOPV	Povinně volitelné předměty B4B33ALG,BAB37APO,..... (see the list of groups below)	Min. cours. 3	Min/Max 14/63			PV

Number of semester: 6

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BBAP20	Bachelor thesis	Z	20	0+12	L,Z	P
2018_BBIOVOL	Volitelné odborné předměty	Min. cours. 0	Min/Max 0/999			V

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

Kód	Name of the group of courses and codes of members of this group (for specification see here or below the list of courses)	Completion	Credits	Scope	Semester	Role
2018_BBIOPV	Povinně volitelné předměty	Min. cours. 3	Min/Max 14/63			PV
B4B33ALG	Algorithms	BAB37APO	Applied Optics	B0B36DBS	Database Systems	
B2B31EO2	Electronic Circuits 2	B3B38LPE	Laboratories of Industrial Elect ...	B0B35LSP	Logic systems and processors	
B0B01LGR	Logic and Graphs	B2B34MIK	Microcontrollers	B4B01NUM	Numerical Analysis	
B4B38NVS	Embedded Systems Design	B2B32STE	Network Technologies	B2B17TBK	Wireless Communication Technique	
B0B02UAK	Introduction to Acoustic					
2018_BBIOVOL	Volitelné odborné předměty	Min. cours. 0	Min/Max 0/999			V

List of courses of this pass:

Code	Name of the course	Completion	Credits
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
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 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.	Z,ZK	5
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
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 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.	KZ	4

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

BEZB	Safety in Electrical Engineering for a bachelor's degree	Z	0
The purpose of the safety course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it. This introductory course contains fundamentals of Safety Electrical Engineering. In this way the students receive qualification of instructed person that enables them to work on electrical equipment.			
BEZZ	Basic health and occupational safety regulations	Z	0
The guidelines were worked out based on The Training Scheme for Health and Occupational Safety designed for employees and students of the Czech Technical University in Prague, which was provided by the Rector's Office of the CTU. Safety is considered one of the basic duties of all employees and students. The knowledge of Health and Occupational Safety regulations forms an integral and permanent part of qualification requirements. This program is obligatory.			

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

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