# 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	Р

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

BBAP20 Bachelor thesis Z 20		Z	20
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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	Р
BAB34BMS	Biomedical sensors Miroslav Husák, Alexandr Laposa, Adam Bouřa, Jan Novák <b>Miroslav Husák</b> Miroslav Husák (Gar.)	Z,ZK	4	2P+2L	Z	Р
BAB02CHE	Chemistry for Bioengineering Jan Přech, Michal Mazur Jan Přech Jan Přech (Gar.)	Z,ZK	3	2P+1L	Z	Р
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	Р
B4M33DZO	Digital image Ondřej Drbohlav, Daniel Sýkora Daniel Sýkora (Gar.)	Z,ZK	6	2P+2C	Z,L	Р
B2B38EMBA	Electrical Measurements Jakub Svatoš Jakub Svatoš (Gar.)	Z,ZK	5	2P+2L	Z	Р
BAB17EMP	Electromagnetic Field Miloslav Čapek Miloslav Čapek (Gar.)	Z,ZK	5	2P+2C	Z	Р

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

Characteristics of the courses of this group of Study Plan: Code=2018\_BBIOP Name=Compulsory subjects of the programme BAB02BFY **Biophysics** Z.ZK 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 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 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 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 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

Z,ZK

5

measurements and basic information concerning measurement systems.

Electromagnetic Field

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

BAB17EMP

B2B31EO1	Electronic Circuits 1	Z,ZK	4
The course introduces to	pasic circuits with operational amplifiers, continues with the description of linear systems, analysis of their characteristics and fu	ndamentals of syn	thesis frequency
	orinciples and features of circuits for generating signals and a controlled oscillator including the PLL circuit and its use. The la	ast part of the cour	rse is devoted to
basic amplifier stages v			
B3B02FY1A	Physics 1	Z,ZK	7
The basic course of phy	sics at the Faculty of Electrical Engineering - Physics 1, is devoted to the introduction into two important areas of physics. The	e first one is a clas	sical mechanics
	ne electric and magnetic field. Within the framework of the classical mechanics, the students study the particle kinematics; dyn		
1	gid bodies. The students should be able to solve basic problems dealing with the description of mechanical systems, which t	-	- 1
	echanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The		-
	dy of electrical circuits, theory of electrotechnical materials or radioelectronics. Apart of this, the knowledge gained in this cou	irse is required for	the study of the
consecutive course Phy			
B3B02FY2	Physics 2	Z,ZK	6
The course Physics 2 is	s 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 present	ed description of t	he waves has a
universal character in s	pite of the waves character. Particular types of waves, such as acoustic or optical waves are the subjects of the following sec	tion. Quantum me	chanics and
1	nplete the student?s general education in physics. The knowledge gained in this course will help to the students in study of s		as robotics,
	uring 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 st	udents of technical dsciplines with basic information about genetics with an emphasis on modern genetic disciplines and kno	wledge that is clo	sely related to
the issue of medical ele	ectronics and especially bioinformatics. The focus is on the organization and function of the human genome, including its pos	sible pathologically	y significant
1 -	ques used to determine them. Students will also learn basic information about clinical genetics, genetic counseling, genetic t	-	
	. The conclusion of the course also deals with original and modern approaches enabling targeted editing of the genome, esp		
-	f the curriculum is oriented towards the human organism, knowledge about the genetics of other living systems - especially p	rokaryotes and vi	ruses - is part of
the teaching.			
B0B01KAN	Complex Analysis	Z,ZK	5
	uction to the fundamentals of complex analysis and its applications. The basic principles of Fourier, Laplace, and Z-transform	are explained, inc	cluding their
applications, particularl	y to solving differential and difference equations.		
B0B01LAGA	Linear Algebra	Z,ZK	7
The course covers intro	ductory topics of linear algebra. It begins with fundamental concepts related to vector spaces and linear transform (such as line	ar dependence an	d independence
of vectors, bases, coord	dinates of vectors, etc.). The next part of the course is devoted to matrix theory (determinants, inverse matrix, matrices of linea	ar transformation,	eigenvalues and
eigenvectors). Applicati	ons include solving systems of linear equations, geometry in three-dimensional space (including dot and cross products), and	d the singular value	e decomposition
of a matrix.			
B0B01MA1A	Mathematical Analysis 1	Z,ZK	6
This is an introductory	ourse to differential and integral calculus of functions of one real variable.		
B0B01MA2	Mathematical Analysis 2	Z,ZK	7
The subject covers an i	ntroduction to the differential and integral calculus in several variables and basic relations between curve and surface integra	ls. Other part cont	tains function
series and power series	s with application to Taylor and Fourier series.		
	with application to Taylor and Founci School		
B0B33OPT		7.7K	7
B0B33OPT The course provides an	Optimization	Z,ZK	
The course provides an	Optimization introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated in the control of		
The course provides an You will refresh and ext	Optimization introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustend many topics that you know from linear algebra and calculus courses.	strated with a num	ber of examples.
The course provides an You will refresh and ext	Optimization introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustend many topics that you know from linear algebra and calculus courses.  Programming in C	strated with a num	ber of examples.
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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	Completion	Credits	Scope	Semester	Role
	members) Tutors, authors and guarantors (gar.)	-				
B0B04B1K	English language B1 - classified assessment  Markéta Havlíčková, Pavla Péterová, Erik Peter Stadnik, Michael Ynsua, Petra  Juna Jennings Petra Juna Jennings Petra Juna Jennings (Gar.)	KZ	0	0C	Z,L	Р
B0B04B2Z	English language B2 - exam  Markéta Havlíčková, Michael Ynsua, Petra Juna Jennings, Dana Saláková  Petra Juna Jennings Petra Juna Jennings (Gar.)	Z,ZK	0	0C	Z,L	Р

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

	<u> </u>		
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.

Note on the gi	<del>-</del>					
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 Daniel Průša, Robert Pěnička <b>Daniel Průša</b> Daniel Průša (Gar.)	Z,ZK	6	2P+2C	Z	PV
BAB37APO	Applied Optics Petr Páta, Jan Bednář, Lukáš Krauz <b>Jan Bednář</b> 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 <b>Martin Řimnáč</b> Martin Řimnáč (Gar.)	Z,ZK	6	2P+2C+4D	L	PV
B2B31EO2	Electronic Circuits 2 Jiří Hospodka <b>Jiří Hospodka</b> 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 Vojtěch Petrucha	KZ	4	0P+4L	L	PV
B3B33LAR	Laboratory of robotics Vladimir Petrik, Pavel Krsek, Libor Wagner Pavel Krsek Pavel Krsek (Gar.)	KZ	4	0P+4L	L	PV
B0B01LGR	Logic and Graphs Alena Gollová, Matěj Dostál, Natalie Žukovec Matěj Dostál Marie Demlová (Gar.)	Z,ZK	5	3P+2S	Z,L	PV
BAB34MNS	Miroslav Husák, Alexandr Laposa, Adam Bouřa <b>Miroslav Husák</b> 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 <b>Mirko Navara</b> 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, Viktor Adler, Jan Šístek, Jan Spáčil, Tomáš Kořínek <b>Přemysl Hudec</b> Přemysl Hudec (Gar.)	KZ	4	2P+2L	L	PV
B0B02UAK	Introduction to Acoustic  Marek Brothánek, 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 o	of the courses of this group of Study Plan: Code=2018_BBIOPV Nan	ne=Compuls	sory sub	jects of th	e progra	ımme
B4B33ALG	Algorithms			Z	,ZK	6
In the course, the algo	rithms development is constructed with minimum dependency to programming language; nev	vertheless the le	ctures and	seminars are	based on Ja	ava. Basic dat
types a data structures	s, basic algorithms, recursive functions, abstract data types, stack, queues, trees, searching,	sorting, special	application	algorithms, D	ynamic pro	gramming.
Students are able to de	esign 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				, <b>(</b> 7	4
The aim of the course	is to gain experience with design, implementation and testing of practical constructions with	sensors for bion	nedical appl	ications and v	vith regard	to the needs o
	vill realize the practical final work.				J	
B0B36DBS	Database Systems			7	,ZK	6
	d as a basic database course mainly aimed at the student ability to design a relational data r	nodel and to use	the SQL la		· .	-
•	choose the appropriate degree of transaction isolation. Students will also get acquainted with					
. , ,	management. They will verify their knowledge during the elaboration of a continuously submi		•	J	,	•
B2B31EO2	Electronic Circuits 2			Z	.ZK	4
	he basic electric circuits course. It introduces multistage transistor amplifiers and basic appli	cations in the fie	ld of electro		· .	come familia
	urement of electronic systems, including nonlinear applications with regard to the real charac					
parameters of power a	amplifiers, linear stabilizers, switching power supply and D/A and A/D converters are presents	S.	•		•	•
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 designin	g machine contr	ol algorithm	1	, I	edge of state
	ns by including uncertainty in state transition. Students are introduced into reinforcement lea	-	-			-
which also connects th	ne artificial intelligence and cybernetics fields. Bayesian decision task introduces supervised	learning. Learnir	ng from data	a is demonstra	ated on a lir	ear classifier
	algoritms in computer labs.					
B3B38LPE	Laboratories of Industrial Electronics and Sensors				۲Z	4
	aboratories" is to introduce students in a playful and interactive way with basic blocks of an i	ndustrial sensor	system - fro			ıgh signal
processing circuits, and	alog to digital signal conversion, software processing by a microcontroller up to the sending of	the results to the	superior sy	stem or datab	ase and the	ir presentatic
to the user within the c	concept "Internet of Things".		-			

to the user within the concept "Internet of Things".

### B3B33LAR Laboratory of robotics

ΚZ

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.

## Logic and Graphs

Z,ZK

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

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

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** The course deals with design of embedded systems using ARM based microcontrollers. Z,ZK

B4B01NUM Numerical Analysis

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. Z.ZK

B3B33ROB Robotics

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

Z

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

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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 (Gar.)	Z,ZK	6	2P+2C	Z	PV
BAB37ZPR	Programming Essentials Stanislav Vitek Stanislav Vitek (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 <b>Michal</b> Novotný Michal Novotný (Gar.)	KZ	4	2P+2L	Z	PV
B2B15UELA	Introduction to Electrical Engineering Radek Havlíček, 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 (Gar.)	KZ	4	2P+2C	Z	٧
B0B16FIL	Philosophy Peter Zamarovský Peter Zamarovský (Gar.)	ZK	2	2P+0S	Z,L	V
B0B16FI1	Philosophy 1 Peter Zamarovský Peter Zamarovský (Gar.)	KZ	4	2P+2S	Z	V
B0B16HTE	History of technology and economic  Marcela Efmertová, Jan Mikeš Marcela Efmertová (Gar.)	ZK	2	2P+0S	Z,L	V
B0B16HT1	History of science and technology 1  Marcela Efmertová, Jan Mikeš 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 (Gar.)	Z,ZK	4	2P+2S	Z,L	V
B0B16MPL	Psychology for managers  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 i	s to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various	s situations of hum	an life. Essentia
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 communa	al answers.	
B0B16FIL	Philosophy	ZK	2
We deal with the me	ost important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philo	sophy and connec	ction of old
philosophical thoug	nts with recent problems of science, technology, economics and politics.		
B0B16FI1	Philosophy 1	KZ	4
We deal with the me	ost important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philo	sophy and connec	ction of old
philosophical thoug	nts 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	<i>7</i> K	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 (Gar.)	Z	0	2C	Z	V
B0B04B12	English Language B1-2 Petra Juna Jennings (Gar.)	Z	0	2C	L	V
B0B04B21	English Language B2-1 Petra Juna Jennings (Gar.)	Z	3	2C	Z	V
B0B04B22	English Language B2-2 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 know	ledge of the Engli	sh language.
B0B04B11	English Language B1-1	Z	0
Course objective: Broa	dening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary	expansion; under	standing spoken
English.			
B0B04B12	English Language B1-2	Z	0
Course objective: Broa	dening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary	expansion; under	standing spoken
English.			
B0B04B21	English Language B2-1	Z	3
This course is designed	d as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk	B2 - zkouška - B0	B04B2Z*). 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 mar	k), it also focuses	more on the
academic and technic	al vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appro	priate level of Eng	lish for Erasmus
/ International Study.			
B0B04B22	English Language B2-2	Z	3
This course is designed	d as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk l	B2 - zkouška - B0l	304B2Z *). While
	d as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk I on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mar		,
the course is focused		k), it also focuses	more on the
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 mar	k), it also focuses	more on the

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 introduc	ces students to the classical theory of ordinary differential equations (separable and linear ODEs) and also to bsics of numerical methods	ods (errors in calc	ulations and
stability, numerical	solutions of algebraic and differential equations and their systems). The course takes advantage of the synnergy between theoretical	al and practical po	int 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 a	re explained, inclu	iding their
	applications, particularly to solving differential and difference equations.		
B0B01LAGA	Linear Algebra	Z,ZK	7
The course covers in	ntroductory topics of linear algebra. It begins with fundamental concepts related to vector spaces and linear transform (such as linear d	ependence and inc	dependence
	cordinates of vectors, etc.). The next part of the course is devoted to matrix theory (determinants, inverse matrix, matrices of linear tra		
eigenvectors). Appli	cations include solving systems of linear equations, geometry in three-dimensional space (including dot and cross products), and the	singular value de	composition
	of a matrix.		
B0B01LGR	Logic and Graphs	Z,ZK	5
This course covers b	pasics of mathematical logic and graph theory. Syntax and semantics of propositional and predicate logic are introduced. The importanc		onsequence
	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	s an introduction to the differential and integral calculus in several variables and basic relations between curve and surface integrals.	Other part contain	s function
	series and power series with application to Taylor and Fourier series.		
B0B01STP	Statistics and Probability	Z,ZK	5
The aim of the co	burse is to introduce students to the fundamentals of probability theory and mathematical statistics, their computational methods as we mathematical tools to practical examples.	vell as applications	of these
B0B02UAK	Introduction to Acoustic	KZ	4
The subject prov	ides overview of main parts of acoustics. In first lectures there is introduction to basic types of sound fields, its solutions and propert	ies. Next chapter d	eals with
introduction to build	ling and room acoustics. The second half of the course deals with introductions to physiological acoustics, psychoacoustics, musical	acoustics, hygiene	elegislation
	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 E	nglish.	

D0D04400			
B0B04A22	English Language A2-2	Z	0
The course is ope	en to students who are beginners in their second foreign language. The course objective is to develop and sustain their basic knowled	dge of the English	
B0B04B11	English Language B1-1	Z	0
Course objective: B	roadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary exp English.	oansion; understan	ding spoken
B0B04B12	English Language B1-2	Z	0
	roadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary exp English.	pansion; understan	_
B0B04B1K	English language B1 - classified assessment  verifying of the student's skills of B1 level	KZ	0
B0B04B21	English Language B2-1	7	3
	gned as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2-	_	_
the course is focu	used on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark) nical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate of the international Study.	, it also focuses mo	ore on the
B0B04B22	English Language B2-2	Z	3
l -	gned as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2 -		
the course is focu	used 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 mo	ore on the
academic and tech	nical vocabulary and grammar expected of students at the university level. *NOTE:This exam is also used for determining an appropria	ate level of English	for Erasmus
	/ International Study.		
B0B04B2Z	English language B2 - exam	Z,ZK	0
	xam is a compulsory subject for all Faculty of Electrical Engineering students at the Czech Technical University. According to the Students		
_	dents at CTU (Part III, Article 4), a compulsory subject is one whose completion is a necessary condition in order to successfully com		-
1	es 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 Euro	-	
" " '	EFR), an international standard for describing language ability, the definition of an English language learner who has achieved the B2		
	stand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisat		_
1 .	ntaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed to	_	-
	vpoint on a topical issue giving the advantages and disadvantages of various options. III) Students who have successfully passed an years may present their certificate to the Department of Languages, Faculty of Electrical Engineering. Upon approval, students are the	• •	
within the past live	Test and the Oral Part. For a list of approved international exams go to the department website: http://jazyky.fel.cvut.cz/	ii exempt iioiii boti	i tile vviitteii
B0B16ET1	Ethic 1	KZ	4
	Etrilo I is to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situ		-
1	f the subject are discussions in which students can react to lectures but also to actual questions coming with news and look for the ca		ie. Loseiiliai
B0B16FI1		KZ	4
	Philosophy 1  e most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philos	1	
vve dear with the	philosophical thoughts with recent problems of science, technology, economics and politics.	sopriy and connecti	on or old
B0B16FIL	Philosophy	ZK	2
	ρημοσορτην e most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philos	1	
vve deal with the			on of old
		sopny and connecti	on of old
BOB16UI1	philosophical thoughts with recent problems of science, technology, economics and politics.		
B0B16HI1	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1	KZ	4
B0B16HT1	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1	KZ KZ	4
B0B16HT1 B0B16HTE	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic	KZ KZ ZK	4 4 2
B0B16HT1 B0B16HTE B0B16MPL	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1	KZ KZ	4
B0B16HT1 B0B16HTE	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic	KZ KZ ZK ZK Z,ZK	4 4 2
B0B16HT1 B0B16HTE B0B16MPL	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers	KZ KZ ZK ZK	4 4 2 2
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology	KZ KZ ZK ZK Z,ZK	4 4 2 2 4 7
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology  Optimization	KZ KZ ZK ZK Z,ZK Z,ZK ted with a number of	4 4 2 2 4 7
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology  Optimization s an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustration	KZ KZ ZK ZK Z,ZK	4 4 2 2 4 7
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT The course provides B0B36DBS The course is designed.	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology  Optimization s an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrativou will refresh and extend many topics that you know from linear algebra and calculus courses.  Database Systems  and as a basic database course mainly aimed at the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the SQL language for the student ability to design a relational data model and to use the square the student ability to design a relational data model and to use the square the sq	KZ KZ ZK ZK Z,ZK Z,ZK ted with a number of the control of the cont	4 4 2 2 4 7 f examples.
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT The course provides B0B36DBS The course is designed.	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology  Optimization s an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated you will refresh and extend many topics that you know from linear algebra and calculus courses.  Database Systems  and as a basic database course mainly aimed at the student ability to design a relational data model and to use the SQL language for the choose the appropriate degree of transaction isolation. Students will also get acquainted with the most commonly used indexing the science of the appropriate degree of transaction isolation.	KZ KZ ZK ZK Z,ZK Z,ZK ted with a number of data definition a techniques, databate	4 4 2 2 4 7 f examples. 6 s well as for
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT The course provides B0B36DBS The course is designated and appropriate and approximate and approxi	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology  Optimization s an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrative you will refresh and extend many topics that you know from linear algebra and calculus courses.  Database Systems  Included as a basic database course mainly aimed at the student ability to design a relational data model and to use the SQL language of the choose the appropriate degree of transaction isolation. Students will also get acquainted with the most commonly used indexing architecture and their management. They will verify their knowledge during the elaboration of a continuously submitted seminar	KZ KZ ZK ZK Z,ZK Z,ZK ted with a number of data definition a techniques, databartask.	4 4 2 2 4 7 of examples. 6 s well as for use system
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT The course provides B0B36DBS The course is designed at a querying and	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology  Optimization s an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated you will refresh and extend many topics that you know from linear algebra and calculus courses.  Database Systems  Introduction to continuously submitted seminar architecture and their management. They will verify their knowledge during the elaboration of a continuously submitted seminar Introduction to Electrical Engineering	KZ KZ ZK ZK Z,ZK Z,ZK ted with a number of the control of the cont	4 4 2 2 4 7 of examples. 6 s well as for use system 4
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT The course provides B0B36DBS The course is designed at a querying and	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology  Optimization s an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated you will refresh and extend many topics that you know from linear algebra and calculus courses.  Database Systems  Introduction to mathematical optimization in statement of the superior of the elaboration of a continuously submitted seminar architecture and their management. They will verify their knowledge during the elaboration of a continuously submitted seminar Introduction to Electrical Engineering  ds students knowledge of topics in power engineering. It provides a basic overview of the electricity production, transmission, distribution in the science of the science	KZ KZ ZK ZK Z,ZK Z,ZK ted with a number of the control of the cont	4 4 2 2 4 7 of examples. 6 s well as for use system 4
B0B16HT1 B0B16HTE B0B16MPL B0B16MPS B0B33OPT The course provides B0B36DBS The course is designed at a querying and and the course expansion.	philosophical thoughts with recent problems of science, technology, economics and politics.  History 1  History of science and technology 1  History of technology and economic  Psychology for managers  Psychology  Optimization s an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated you will refresh and extend many topics that you know from linear algebra and calculus courses.  Database Systems  Introduction to elactrical generating architecture and their management. They will verify their knowledge during the elaboration of a continuously submitted seminar Introduction to Electrical Engineering  ds students knowledge of topics in power engineering. It provides a basic overview of the electricity production, transmission, distribution introduces the principles of electrical machines, and broadens understanding of materials used in electrical engineering.	KZ KZ ZK ZK Z,ZK Z,ZK ted with a number of techniques, databar task. KZ Ltion, and consumptions	4 4 2 2 4 7 of examples. 6 s well as for use system 4 otion chain,
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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 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. 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. B2B38EMBA **Electrical Measurements** 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 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. Z,ZK B3B02FY2 Physics 2 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 6 This subject will give students a basic understanding of algorithms and programming and leach 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 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 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. Laboratories of Industrial Electronics and Sensors 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". Numerical Analysis 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. Algorithms 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 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. Z,ZK B4B36ZUI Introduction to Artificial Intelligence 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 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

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** 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 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 This course gets its students acquinted with principles and applied electromagnetic field theory basics. ΚZ BAB31AF1 Fundamentals of Anatomy and Physiology I 4 This theoretical and practical course introduces students to professional anatomical terminology while providing them with basic knowledge of human anatomy and physiology. Fundamentals of Anatomy and Physiology II Z,ZK BAB31AF2 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. Genetics BAB31GEN 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 ΚZ The course presents the basics of biomedical engineering and provides illustrative examples of projects performed by the faculty teams. BAB31ZZS Basic Signal Processing 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 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.). Biomedical Sensors Practically 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 The content of the course are knowledge of new principles of operation of components and systems with micro-dimensions, microsystems, microsystems 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 Z.ZK 6 Programming in C 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 20 Ζ

fundamental principles (signal sampling and reconstruction, monadic operations, histogram, Fourier transform, convolution, linear and non-linear filtering) and more advanced editing

For updated information see <a href="http://bilakniha.cvut.cz/en/f3.html">http://bilakniha.cvut.cz/en/f3.html</a> Generated: day 2025-11-30, time 06:49.

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