Study plan

Name of study plan: Cybernetics and Robotics 2016

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: Cybernetics and Robotics

Type of study: Bachelor full-time

Required credits: 174
Elective courses credits: 6
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: 158

The role of the block: P

Code of the group: 2021_BKYRBAP 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 meila Roman meila (Gar.)	Z	20	12S	L,Z	Р

Characteristics of the courses of this group of Study Plan: Code=2021_BKYRBAP Name=Bachelor Project

BBAP20 Bachelor thesis Z 20

Code of the group: 2021 BKYRBBE

Name of the group: Safety of the bachelor's studies

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 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
BEZB	Safety in Electrical Engineering for a Bachelor's Degree Ivana Nová, Radek Havlí ek, Vladimír K la Radek Havlí ek Vladimír K la (Gar.)	Z	0	2BP+2BC	Z,L	Р
BEZZ	Basic Health and Occupational Safety Regulations Ivana Nová, Radek Havlí ek, Vladimír K la Radek Havlí ek Vladimír K la (Gar.)	Z	0	2BP+2BC	Z	Р

Characteristics of the courses of this group of Study Plan: Code=2021_BKYRBBE Name=Safety of the bachelor's studies

BEZB	Safety in Electrical Engineering for a Bachelor's Degree		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.

Code of the group: 2021_BKYRP

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 138 credits

Requirement courses in the group: In this group you have to complete 24 courses

Credits in the group: 138

Note on the group:

Note on the gro	•					
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 Vojt ch Vonásek Vojt ch Vonásek (Gar.)	Z,ZK	6	2P+2C	Z	Р
B3B35ARI1	Automatic Control Michael Šebek, Tomáš Haniš, Martin Hrom ík Tomáš Haniš Michael Šebek (Gar.)	Z,ZK	6	4P+2L	L	Р
B0B01DRN	Differencial Equations and Numerical Analysis Petr Habala, Jakub Rondoš, Jakub Stan k, Daniel Gromada, Josef Dvo ák Petr Habala Petr Habala (Gar.)	Z,ZK	4	2P+2C	L	Р
B3B31EPO	Electronic Devices and Circuits Ji í Hospodka, Ond ej Brunner, Jan Havlík Ji í Hospodka Ji í Hospodka (Gar.)	Z,ZK	6	4P+2L	Z	Р
B3B02FY1A	Physics 1 Petr Koni ek, Michal Bedna ik Michal Bedna ik Michal Bedna ik (Gar.)	Z,ZK	7	4P+1L+2C	L	Р
B3B02FY2	Physics 2 Petr Koní ek, Michal Bedna ík, Marek Brothánek, Vojt ch Jandák Michal Bedna ík Michal Bedna ík (Gar.)	Z,ZK	6	3P+1L+2C	Z	Р
B3B35HSS	Humanitní, um lecký a spole enskov dní seminá Michael Šebek, Martin Hlinovský Michael Šebek Michael Šebek (Gar.)	Z	4	3S	L	Р
B3B01KAT1	Complex Analysis and Transformations Martin Bohata, Hana Tur inová Martin Bohata (Gar.)	Z,ZK	6	4P+2S	Z	Р
B3B38KDS1	Communication and Distributed Systems Jan Holub, Ji í Novák Ji í Novák Ji í Novák (Gar.)	Z,ZK	6	4P+2L	Z	Р
B3B33KUI	Cybernetics and Artificial Intelligence Tomáš Svoboda, Petr Pošík Tomáš Svoboda Tomáš Svoboda (Gar.)	Z,ZK	6	2P+2C	L	Р
B0B01LAG	Linear Algebra Jakub Rondoš, Daniel Gromada, Ji í Velebil, Natalie Žukovec, Mat j Dostál Ji í Velebil Ji í Velebil (Gar.)	Z,ZK	8	4P+2S	Z	Р
B0B35LSP	Logic systems and processors Martin Hlinovský, Richard Šusta Martin Hlinovský Zden k Hurák (Gar.)	Z,ZK	6	2P+2L	L	Р
B0B01LGR	Logic and Graphs Natalie Žukovec, Mat j Dostál, Alena Gollová Mat j Dostál Marie Demlová (Gar.)	Z,ZK	5	3P+2S	Z,L	Р
B0B01MA1	Mathematical Analysis 1 Josef Dvo ák, Martin K epela, Josef Tkadlec, Veronika Sobotíková Josef Tkadlec Josef Tkadlec (Gar.)	Z,ZK	7	4P+2S	Z,L	Р
B0B01MA2	Mathematical Analysis 2 Martin Bohata, Hana Tur inová, Miroslav Korbelá, Petr Hájek, Jaroslav Tišer, Karel Pospíšil, Paola Vivi 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
B0B01PST1	Probability and Statistics Jakub Stan k, Kate ina Helisová Kate ina Helisová (Gar.)	Z,ZK	6	4P+2S	Z	Р
B3B04PRE	Presentation Skills Jitka Pinková, Petra Juna Jennings Jitka Pinková Petra Juna Jennings (Gar.)	KZ	2	2C	L	Р
B3B36PRG	Programming in C Jan Faigl Jan Faigl (Gar.)	Z,ZK	6	2P+2C	L	Р
B3BPROJ5	Bachelor project Martin Hlinovský, Petr Pošík, Tomáš Drábek, Kamila Krupková, Drahomíra Hejtmanová, Šárka Hejtmanová, Jana Zichová Martin Hlinovský Martin Hlinovský (Gar.)	Z	5	4s	Z	Р
B3B35RO1	Robots Martin Hlinovský, David Pa il, Vojt ch Petrucha, Pavel Krsek, Mat j Št tka Vojt ch Petrucha Martin Hlinovský (Gar.)	KZ	4	1P+3L	Z	Р
B3B33ROB1	Robotics Vladimír Petrík Vladimír Smutný Vladimír Petrík (Gar.)	Z,ZK	6	2P+2L	Z	Р
B3B38SME1	Sensors and Measurement Vojt ch Petrucha, Pavel Ripka Vojt ch Petrucha Vojt ch Petrucha (Gar.)	Z,ZK	6	3P+2L	L	Р
B3B31SSI	Signals, systems and inference Radoslav Bortel, Michal Simek Radoslav Bortel Radoslav Bortel (Gar.)	Z,ZK	6	4P+2C	Z	Р

Characteristics of the courses of this group of Study Plan: Code=2021_BKYRP Name=Compulsory subjects of the programme

Foundation course of automatic control. Introduction to basic concepts and properties of dynamic systems of physical, engineering, biological, econominature. Basic principles of feedback and its use as a tool for altering the behavior of systems and managing uncertainty. Classical and modern methods automatic control systems. Students specialized in systems and control will build on these ideas and knowledge in the advanced courses to follow. Students programs will find out that control is an inspiring, ubiquitous and entertaining field worth of a future cooperation. Students? creativity is developed in our BOBO1DRN Differencial Equations and Numerical Analysis This course introduces students to the classical theory of ordinary differential equations (separable and linear ODEs) and also to bsics of numerical methods at a stability, numerical solutions of algebraic and differential equations and their systems). The course takes advantage of the synnergy between theoretical B3B31EPO Electronic Devices and Circuits The course introduces students to the basic principles and methods of analysis of electrical circuits. Defines the circuit elements and gives their element the basic fundaments of electronic systems based on analog as well as digital circuits. The course presents operational principles and methods of analysis to the use of cybernetics and control systems. B3B02FY1A Physics 1	Type of the process o	6 d informatics nd design of branches and 4 calculations and				
understand the notion of computational complexity. They will learn about basic program building blocks such as loops, conditional statements, variables 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 Students will learn to write simple programs in Python. B3B35ARI1 Automatic Control Foundation course of automatic control. Introduction to basic concepts and properties of dynamic systems of physical, engineering, biological, econominature. Basic principles of feedback and its use as a tool for altering the behavior of systems and managing uncertainty. Classical and modern methods automatic control systems. Students specialized in systems and control will build on these ideas and knowledge in the advanced courses to follow. Students programs will find out that control is an inspiring, ubiquitous and entertaining field worth of a future cooperation. Students? creativity is developed in our BOBO1DRN Differencial Equations and Numerical Analysis This course introduces students to the classical theory of ordinary differential equations (separable and linear ODEs) and also to bsics of numerical methods stability, numerical solutions of algebraic and differential equations and their systems). The course takes advantage of the synnergy between theoretica B3B31EPO Electronic Devices and Circuits The course introduces students to the basic principles and methods of analysis of electrical circuits. Defines the circuit elements and gives their element the basic fundaments of electronic systems based on analog as well as digital circuits. The course presents operational principles and methods of analys to the use of cybernetics and control 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 fire	Type of the process o	6 d informatics nd design of branches and 4 calculations and				
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B3B35ARI1 Automatic Control Foundation course of automatic control. Introduction to basic concepts and properties of dynamic systems of physical, engineering, biological, econominature. Basic principles of feedback and its use as a tool for altering the behavior of systems and managing uncertainty. Classical and modern methods automatic control systems. Students specialized in systems and control will build on these ideas and knowledge in the advanced courses to follow. Stude programs will find out that control is an inspiring, ubiquitous and entertaining field worth of a future cooperation. Students? creativity is developed in our B0B01DRN Differencial Equations and Numerical Analysis This course introduces students to the classical theory of ordinary differential equations (separable and linear ODEs) and also to bsics of numerical methods stability, numerical solutions of algebraic and differential equations and their systems). The course takes advantage of the synnergy between theoretica B3B31EPO Electronic Devices and Circuits The course introduces students to the basic principles and methods of analysis of electrical circuits. Defines the circuit elements and gives their element the basic fundaments of electronic systems based on analog as well as digital circuits. The course presents operational principles and methods of analysis to the use of cybernetics and control 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 fire	cs, robotics and for analysis are ents of other be laboratories. Z,ZK loods (errors in company and practical parts) Z,ZK tary application	d informatics and design of branches and 4 calculations and				
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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 fire		uits with respec				
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 fire	Z,ZK	7				
and the second one is the electric and magnetic field. Within the framework of the classical mechanics, the students study the particle kinematics; dynamic						
	cs 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		U				
studies. The classical mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The studies are used in the course in the classical mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The studies are used in the classical mechanics in the classical mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The studies is the classical mechanics in the classical mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The studies is the classical mechanics in the classical mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary.		J				
in this course in the study of electrical circuits, theory of electrotechnical materials or radioelectronics. Apart of this, the knowledge gained in this course consecutive course Physics 2.	is required for	the study of the				
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 the		_				
- 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	-					
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 med	chanics 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.						
B3B35HSS Humanitní, um lecký a spole enskov dní seminá	Z 71/	4				
B3B01KAT1 Complex Analysis and Transformations	Z,ZK	6				
B3B38KDS1 Communication and Distributed Systems The course is devoted to the principles of communication in distributed systems (DS), both in common computer networks and in specialized networks	Z,ZK	6				
networks for the Internet of Things. 1. Introduction, basic concepts, ISO / OSI model 2. Systems with distributed parameters, physical channel (metallic,						
properties 3. Communication channel models (AWGN, BSC), narrowband analog and digital modulation 4. Entropy of information source, source and ch	-	•				
5. Codes for error detection and correction (groups and solids, linear and cyclic codes) 6. Information confidentiality, symmetric and asymmetric encryptic	n, key distribut	ion, certificates				
digital signature 7. Types of data transmissions, multiplexing, methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical and logical topologies, ARQ methods of access control to shared media 8. Physical topologies and logical topologies and logi	_					
systems 9. Industrial distributed systems (IDS), virtual field device, object directory 10. Functional principles of IDS, typical applications and their solution networks, functional principles, implementation of real-time functions, time synchronization 12. Wireless LANs and Internet of Things networks 13. TCP /	-					
ARP, DHCP, ICMP, NAT, 14. Transport protocols of the TCP / IP, UDP, TCP, RTP family, data flow control, congestion control Laboratory exercises will be						
acquisition of theoretical knowledge. They will require home preparation in the form of self-study, subsequent elaboration of a protocol evaluating the mo		-				
results, their agreement with theoretical assumptions and justifying any differences. The credit project will focus on the practical implementation of data						
properties in the IP network environment.						
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 adva	nces the know	6				
space search algorithms by including uncertainty in state transition. Students are introduced into reinforcement learning for solving problems when the		rledge of state s are unknown,				
space search algorithms by including uncertainty in state transition. Students are introduced into reinforcement learning for solving problems when the which also connects the artificial intelligence and cybernetics fields. Bayesian decision task introduces supervised learning. Learning from data is demo		rledge of state s are unknown,				
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space search algorithms by including uncertainty in state transition. Students are introduced into reinforcement learning for solving problems when the which also connects the artificial intelligence and cybernetics fields. Bayesian decision task introduces supervised learning. Learning from data is demostudents practice the algoritms in computer labs. B0B01LAG Linear Algebra	Z,ZK pependence, bas	vledge of state s are unknown, linear classifier. 8 sis, coordinates				
space search algorithms by including uncertainty in state transition. Students are introduced into reinforcement learning for solving problems when the which also connects the artificial intelligence and cybernetics fields. Bayesian decision task introduces supervised learning. Learning from data is demonstrated by the supervised learning. Lea	Z,ZK ependence, basenext. The applic	eledge of state s are unknown, linear classifier. 8 sis, coordinates, cations include				
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space search algorithms by including uncertainty in state transition. Students are introduced into reinforcement learning for solving problems when the which also connects the artificial intelligence and cybernetics fields. Bayesian decision task introduces supervised learning. Learning from data is demonstrated by the supervised learning. Lea	Z,ZK ependence, base. Expendence, base. Expendence, base. Expendence, base. Expendence, base. Expendence, base. Expendence, base. Expendence, base. Expendence, base. Expendence, base. Expendence, base. Expendence, base.	eledge of state s are unknown, linear classifier. 8 sis, coordinates, cations include 6 s at the hardware				
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B0B01PST1	Probability and Statistics	Z,ZK	6			
Basics of probability theory and mathematical statistics. Includes descriptions of probability, random variables and their distributions, characteristics and operations with random variables.						
Basics of mathematical statistics: Point and interval estimates, methods of parameters estimation and hypotheses testing, least squares method. Basic notions and results of the theory						
of Markov chains.						
B3B04PRE	Presentation Skills	KZ	2			
B3B36PRG	Programming in C	Z,ZK	6			
The course targets to g	ain a deep, comprehensive knowledge of the C programming language in terms of program operation, access and memory m	anagement, and	the development			
of multi-threaded applic	ations. The course emphasizes acquiring programming habits for creating readable and reusable programs. Students get acc	quainted with the	compilation of			
the source codes and th	eir debugging. Lectures are based on the presentation of basic software constructs and demonstration of motivational program	s with practical co	nstructs pointing			
to the readability and st	ructure of source code, real computational complexity, and related tools for profiling and debugging. Students get acquainted	with the principle	s of parallel			
programming of multi-th	readed applications, synchronization mechanisms, and models of multi-threaded applications. At the end of the semester, the b	asic features of the	e object-oriented			

	<u> </u>					
B3BPROJ5	Bachelor project	Z	5			
B3B35RO1	Robots	KZ	4			
B3B33ROB1	Robotics	Z,ZK	6			
B3B38SME1	Sensors and Measurement	Z,ZK	6			

^{1.} Sampling, D / A and A / D converters, digital oscilloscope 2. Measurement of voltage and current (digital voltmeter and multimeter, analog measuring instruments) measurement of frequency and phase difference, error and uncertainty, Measurement of effective value, power and energy consumption 3. Resistance measurement, resistance temperature and deformation sensors. Low voltage measurement, thermocouple temperature measurement 4. Magnetic sensors, magnetic measurements, voltage and current transformer Sensors el. Proudu. Impedance measurement 5 Capacitive and inductive sensors Measurement of linear and angular position - magnetic and optoelectronic sensors 6. sensors for measuring speed and speed, sensors and transducers for measuring acceleration. Vibration measurement 7 Temperature measurement by contact sensors 8. Non-contact temperature measurement 9. Measurement of force and pressure. Level measurement 10. Flow and level measurement 11. Measuring systems, sensor buses. Logic analyzer 12. Other measuring instruments, standards of electrical quantities 13. Chemical sensors 14. Repetition, solution of test examples

| Signals, systems and inference | Z,ZK | 6 |

Code of the group: 2021 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:

C ++ extension are briefly presented.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members)	Completion	Credits	Scope	Semester	Role
B0B04B1K	Tutors, authors and guarantors (gar.) English language B1 - classified assessment Petra Juna Jennings, Markéta Havlí ková, Pavla Péterová, Erik Peter Stadnik, Michael Ynsua Petra Juna Jennings Petra Juna Jennings (Gar.)	KZ	0	0C	Z,L	Р
B0B04B2Z	English language B2 - exam Petra Juna Jennings, Markéta Havlí ková, Michael Ynsua, 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=2021_BZAJ Name=Exam from the english language

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

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

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 16

The role of the block: PV

Code of the group: 2021_BKYRPV

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 12 credits

Requirement courses in the group: In this group you have to complete 2 courses

Credits in the group: 12 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
A8B37DCMA	Digital Communications Jan Sýkora Jan Sýkora Jan Sýkora (Gar.)	Z,ZK	6	3P+1C	Z	PV
B3B14EPR1	Electric Drives for Automation and Robotics Jan Bauer, Vít Hlinovský Jan Bauer Jan Bauer (Gar.)	Z,ZK	6	2P+2L	L	PV
B0B02FVK	Physics of waves and oscillations	Z,ZK	6	2P+2C+4D	L	PV
B3B35JVC	How to make (almost) anything Jií Zemánek Jií Zemánek (Gar.)	KZ	6	2P+4L	L	PV
B3B35MSD1	Modeling and simulation of dynamic systems Zden k Hurák, Ji í Zemánek Ji í Zemánek Zden k Hurák (Gar.)	Z,ZK	6	2P+2C	Z	PV
B3B38OTE1	Circuit Technologies Jan Holub Jan Holub (Gar.)	Z,ZK	6	2P+2L	L	PV
B0B01PAN	Advanced Analysis Veronika Sobotíková, Jan Hamhalter Veronika Sobotíková Jan Hamhalter (Gar.)	Z,ZK	6	2P+2S	L	PV
B3B35PAR1	Programming of logic controllers and robots Martin Hlinovský, Pavel Burget Pavel Burget (Gar.)	Z,ZK	6	1P+3L	L	PV
B3B33UROB	Robot Learning Karel Zimmermann Karel Zimmermann (Gar.)	Z,ZK	6	2P+2C	Z	PV
B3B38VSY1	Embedded Systems Jan Fischer Jan Fischer (Gar.)	Z,ZK	6	2P+2L	Z	PV

Characteristics of the courses of this group of Study Plan: Code=2021_BKYRPV Name=Compulsory subjects of the programme

A8B37DCMA	Digital Communications	Z,ZK	6			
The course provides fundamentals of digital communications theory: modulation, classical coding, channel models, and basic principles of decoding. The exposition is systematically						
built along the theoretical lines which allow to reveal all inner connections and principles. This allows students to develop the knowledge and use it in an active way in a design and						
construction of the com	munication systems. The course provides a necessary fundamental background for subsequent more advanced communicat	ions theory cours	20			

B3B14EPR1 Electric Drives for Automation and Robotics

nunications theory courses.

Z,ZK 6

The aim of the course is to understand the basic principles of rotating machines, to gain an overview of their properties and capabilities, control methods, including respecting the influence of the load on the drive. The course provides a brief overview of the basic types of electric drives. It deals with drives that are used as servo drives, ie DC, asynchronous, synchronous with permanent magnets and marginally special motors. The course discusses the topologies of power electronic converters, including basic modulation strategies and strategies for the control of servo drives such as vector, direct, MTPA control with emphasis on today's most commonly used PMSM motors. The course is focused not only on understanding the physical nature of the type of drive, but also on understanding the principles of operation of other important components such as sensors, semiconductor converters and digital controllers themselves. It also includes a description of the interaction of the drive with the inertial mass of the load in servomechanisms and other typical types of load in general.

B0B02FVK	Physics of waves and oscillations	Z,ZK	6
B3B35JVC	How to make (almost) anything	KZ	6
B3B35MSD1	Modeling and simulation of dynamic systems	Z,ZK	6
B3B38OTE1	Circuit Technologies	Z,ZK	6

Students will get acquainted with the basic types of circuits and structural blocks of digital instruments and equipment. Emphasis is placed on the continuity of individual circuits in terms of accuracy in analog or, analog-to-digital circuits. 1. Structure of digital measuring instruments and signal generators 2. Directly coupled amplifiers and attenuators 3. Isolation and modulation amplifiers 4. Circuits for conversion of mean and rms value, peak detectors 5. Circuits for frequency signal conditioning, oscillators, mixers 6. Reference voltage and current sources, sine and function generators 7. Design of strings and channels of analog blocks - signal levels, linearity, interference 8. Switching and coupling circuits 9. Time and amplitude discretization of signal, samplers, errors 10. Advanced analog-to-digital converters 11. Digital-to-analog converters, signal reconstruction 12. Digital circuits for frequency and phase measurement, phase synchronization, direct digital synthesis 13. Circuits for the implementation of interfaces for connection to buses 14. Design of analog and digital part in terms of self-radiation and resistance to interference The laboratory exercises of the first part of the semester take place on suitable universal preparations, enabling students to work with HW in an efficient and at the same time creative way. In the second part of the semester, laboratory exercises will be solved in the form of an individual project, the content of which is the design and implementation of a model of an analog signal preprocessing block and comparison of its properties with a professional product.

B0B01PAN	Advanced Analysis	Z,ZK	6			
Subject serves as an introduction to measure and integration theory and functional analysis. The first part deals with Lebesgue integration theory. Next parts are devoted to basic						
concepts of the theory of Banach and Hilbert spaces and their connection to harmonic analysis. Last part deals with spectral theory of operators and their application to matrix analysis						

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B3B35PAR1	Programming of logic controllers and robots	Z,ZK	6		
B3B33UROB	Robot Learning	Z.ZK	6		

The course teaches deep learning methods on known robotic problems, such as semantic segmenation or reactive motion control. The overall goal is timeless universal knowledge rather than listing all known deep learning architectures. Students are assumed to have working prior knowledge of mathematics (gradient, jacobian, hessian, gradient descend, taylor polynomial) and machine learning (bayes risk minimization, linear classifier). The labs are divided into two parts, in the first one, the students will solve elementary deep ML tasks from scratch (including the reimplementation of autograd backpropagation), in the second one, students will build on existing templates in order to solve complex tasks including RL, tranformers and generative networks.

B3B38VSY1 Embedded Systems Z,ZK 6

The course is focused on the means, components and solutions of embedded systems, with microcontrollers with ARM Cortex-M core. After introductory tasks within the lab. students solve two smaller and two larger vest projects, system with a microcontroller and other electronic blocks on a solderless contact field. Projects include program and circuit implementation.

Code of the group: 2021 BKYRLAB

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 12)

Requirement courses in the group: In this group you have to complete at least 1 course (at most 3)

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
B3B35LAR	Laboratory of applied electronics and control Martin Hlinovský Martin Hlinovský (Gar.)	KZ	4	0P+4L	L	PV
B3B38LPE1	Laboratories of Industrial Electronics Vojt ch Petrucha	KZ	4	0P+4L	L	PV
B3B33LAR	Laboratory of robotics Pavel Krsek, Vladimír Petrík, Libor Wagner Pavel Krsek Pavel Krsek (Gar.)	KZ	4	0P+4L	L	PV

Characteristics of the courses of this group of Study Plan: Code=2021_BKYRLAB Name=Compulsory subjects of the programme

B3B35LAR	Laboratory of applied electronics and control	KZ	4
B3B38LPE1	Laboratories of Industrial Electronics	KZ	4
B3B33LAR	Laboratory of robotics	KZ	4

During this laboratory courses the students are introduced with the practical robotics through solving of practical tasks. Students are working in laboratories in groups which consist of 3 or 4 members. During the semester, each group of students jointly solve one practical problem in the field of robotics. Tasks are designed to introduce students with robotics (manipulators and mobile robots). The students should utilize the basic knowledge obtained in previous study (eg. mathematics, physics, electronics, software development). Students can select specific task from few tasks with different specialization, which are announced each semester. Tasks differs between semesters. An integral part of the solution of the problem is cooperation and communication in the student team.

Name of the block: Elective courses Minimal number of credits of the block: 0

The role of the block: V

Code of the group: 2021_BKYRH

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:

Note on the group	ο.					
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 Sláme ka Vladimír Sláme ka Vladimír Sláme ka (Gar.)	KZ	4	2P+2C	Z	V
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 Marcela Efmertová (Gar.)	ZK	2	2P+0S	Z,L	V
B0B16HT1	History of science and technology 1 Marcela Efmertová, Jan Mikeš Marcela Efmertová Marcela Efmertová (Gar.)	KZ	4	2P+2S	Z	V
B0B16HI1	History 1 Milena Josefovi ová Milena Josefovi ová (Gar.)	KZ	4	2P+2S	Z	V
B0B16MPS	Psychology Jan Fiala Jan Fiala Jan Fiala (Gar.)	Z,ZK	4	2P+2S	Z,L	V
B0B16MPL	Psychology for managers Jan Fiala Jan Fiala (Gar.)	ZK	2	2P+0S	Z,L	V

Characteristics of the courses of this group of Study Plan: Code=2021_BKYRH 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 hum	an life. Essential
parts of the subject a	are discussions in which students can react to lectures but also to actual questions coming with news and look for the communa	l answers.	
B0B16FIL	Philosophy	ZK	2
We deal with the mo	st important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philos	sophy and conne	ction of old
philosophical though	ts with recent problems of science, technology, economics and politics.		
B0B16FI1	Philosophy 1	KZ	4
We deal with the mo	st important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philos	sophy and conne	ction of old
philosophical though	ts with recent problems of science, technology, economics and politics.		
B0B16HTE	History of technology and economic	ZK	2
B0B16HT1	History of science and technology 1	KZ	4
B0B16HI1	History 1	KZ	4
B0B16MPS	Psychology	Z,ZK	4
B0B16MPL	Psychology for managers	ZK	2

Code of the group: 2021_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	Г	V
B0B04B11	English Language B1-1 Petra Juna Jennings Petra Juna Jennings (Gar.)	Z	0	2C	Z	V
B0B04B12	English Language B1-2 Petra Juna Jennings Petra Juna Jennings (Gar.)	Z	0	2C	L	V
B0B04B21	English Language B2-1 Petra Juna Jennings Petra Juna Jennings (Gar.)	Z	3	2C	Z	V
B0B04B22	English Language B2-2 Petra Juna Jennings Petra Juna Jennings (Gar.)	Z	3	2C	Z,L	V

Characteristics of the courses of this group of Study Plan: Code=2021_BJKA Name=English language courses

B0B04A21	English Language A2-1	Z				
The course is open to s	tudents 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 s	tudents who are beginners in their second foreign language. The course objective is to develop and sustain their basic knowl	ledge of the Engli	sh language.			
B0B04B11	English Language B1-1	Z	0			
Course objective: Broad	ening 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: Broad	ening 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	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 o	n helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher marl	k), it also focuses	more on the			
	vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an approximation of the students are the university level.	priate level of Enq	glish for Erasmus			
/ International Study.						
B0B04B22	English Language B2-2	Z	3			
This course is designed as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2 - zkouška - B0B04B2Z *). While						
the course is focused on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark), it also focuses more on the						
	academic and technical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate level of English for Erasmus					
/ International Study.						

Code of the group: BTV

Name of the group: Physical education

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
TVV	Physical education	Z	0	0+2	Z,L	V
TV-V1	Physical education	Z	1	0+2	Z,L	V
TVV0	Physical education	Z	0	0+2	Z,L	V

Characteristics of the courses of this group of Study Plan: Code=BTV Name=Physical education

TVV	Physical education	Z	0
TV-V1	Physical education	Z	1
TVV0	Physical education	Z	0

Code of the group: BTVK

Name of the group: Physical education courses

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0 Note on the group:

11010 011 1110 9101	2P.					
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
TVKLV	Physical Education Course	Z	0	7dní	L	V
TVKZV	Physical Education Course	Z	0	7dní	Z	V

Characteristics of the courses of this group of Study Plan: Code=BTVK Name=Physical education courses

TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0

Code of the group: 2021_BKYRVOL 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
A8B37DCMA	Digital Communications	Z,ZK	6
The course provide	s fundamentals of digital communications theory: modulation, classical coding, channel models, and basic principles of decoding. The	e exposition is sys	stematicall
built along the the	oretical lines which allow to reveal all inner connections and principles. This allows students to develop the knowledge and use it in a	n active way in a c	lesign and
construction	of the communication systems. The course provides a necessary fundamental background for subsequent more advanced communic	cations theory cou	irses.
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 metho	ods (errors in calc	ulations ar
stability, numerical	solutions of algebraic and differential equations and their systems). The course takes advantage of the synnergy between theoretical	and practical poi	int of view.
B0B01LAG	Linear Algebra	Z,ZK	8
he course covers the	ne initial parts of linear algebra. Firstly, the basic notions of a linear space and linear mappings are covered (linear dependence and inde	pendence, basis,	coordinate
etc). The calculus o	f matrices (determinants, inverse matrices, matrices of a linear map, eigenvalues and eigenvectors, diagonalisation, etc) is covered r	next. The application	ons includ
	solving systems of linear equations, the geometry of a 3D space (including the scalar product and the vector product) and SV	D.	
B0B01LGR	Logic and Graphs	Z,ZK	5
his course covers b	pasics of mathematical logic and graph theory. Syntax and semantics of propositional and predicate logic are introduced. The importance		onsequen
	and of the relationship between a formula and its model is stressed. Further, basic notions from graph theory are introduced	l.	
B0B01MA1	Mathematical Analysis 1	Z,ZK	7
	The aim of the course is to introduce students to basics of differential and integral calculus of functions of one 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.		
B0B01PAN	Advanced Analysis	Z,ZK	6
Subject serves as	an introduction to measure and integration theory and functional analysis. The first part deals with Lebesgue integration theory. Nex	t parts are devote	d to basic
concepts of the thec	ory of Banach and Hilbert spaces and their connection to harmonic analysis. Last part deals with spectral theory of operators and their	application to mat	rix analys
B0B01PST1	Probability and Statistics	Z,ZK	6
Basics of probability	theory and mathematical statistics. Includes descriptions of probability, random variables and their distributions, characteristics and ope	rations with rando	m variable
Basics of mathemat	ical statistics: Point and interval estimates, methods of parameters estimation and hypotheses testing, least squares method. Basic no	tions and results o	of the theo
	of Markov chains.		
B0B02FVK	Physics of waves and oscillations	Z,ZK	6
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 Er	nglish.	
B0B04A22	English Language A2-2	Z	0
The course is ope	n to students who are beginners in their second foreign language. The course objective is to develop and sustain their basic knowled	ge of the English	language.
B0B04B11	English Language B1-1	Z	0
Course objective: Br	roadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansions.	ansion; understan	ding spoke
-	English.		
B0B04B12	English Language B1-2	Z	0
	roadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expa	ansion; understan	ding spoke
-	English.		

B0B04B1K	English language B1 - classified assessment	KZ	0
	verifying of the student's skills of B1 level		
B0B04B21	English Language B2-1	Z POROAR	3
_	ned as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2 - sed on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark)		
	sed of rielping students reach a lever required to pass the be-rever English Examination (of improve their English of a higher mark) nical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropria		
	/ International Study.		
B0B04B22	English Language B2-2	Z	3
This course is design	ned as a full-year, two semester preparation course for the universitys compulsory B2-level English Examination (Anglický jazyk B2 -	zkouška - B0B04B	2Z *). While
	sed on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark)		
academic and techr	ical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropria	te level of English f	or Erasmus
DODO4D07	/ International Study.	7 71/	
B0B04B2Z	English language B2 - exam xam is a compulsory subject for all Faculty of Electrical Engineering students at the Czech Technical University. According to the Stud	Z,ZK	0 Rules and
-	dents at CTU (Part III, Article 4), a compulsory subject is one whose completion is a necessary condition in order to successfully com	=	
•	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		٠ .
for Languages (CE	FR), an international standard for describing language ability, the definition of an English language learner who has achieved the B2	(Upper-Intermedia	ate) level is
	stand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisate		٠ ا
	taneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed to	•	,
•	point on a topical issue giving the advantages and disadvantages of various options. III) Students who have successfully passed an rears may present their certificate to the Department of Languages, Faculty of Electrical Engineering. Upon approval, students are the		
within the past five y	Test and the Oral Part. For a list of approved international exams go to the department website: http://jazyky.fel.cvut.cz/	r exempt from both	Ture writter
B0B16ET1	Ethic 1	KZ	4
	s to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situ		- 1
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 co	mmunal answers.	
B0B16FI1	Philosophy 1	KZ	4
We deal with the	most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy.	ophy and connection	on of old
	philosophical thoughts with recent problems of science, technology, economics and politics.		
B0B16FIL	Philosophy	ZK	2
we deal with the	most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophical thoughts with recent problems of science, technology, economics and politics.	opny and connection	on of old
B0B16HI1	History 1	KZ	4
B0B16HT1	History of science and technology 1	KZ	4
B0B16HTE	History of science and technology in	ZK	2
B0B16MPL	Psychology for managers	ZK	2
B0B16MPS	Psychology	Z,ZK	4
B0B33OPT	Optimization	Z,ZK	7
	s an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrat		-
	You will refresh and extend many topics that you know from linear algebra and calculus courses.		
B0B35LSP	Logic systems and processors	Z,ZK	6
The course introduc	es computing resources' basic hardware structures, design, and architecture. It provides an overview of the possibilities of performing d	ata operations at th	ne hardware
	g embedded processor systems with peripherals on modern FPGA programmable logic circuits, which are increasingly widely used to	-	
=	DL, from logic to more complex sequential circuits to practical finite state machine (FSM) designs. They will also master the correct di		-
Simulation. Practica	problems are solved using development boards that hundreds of leading universities worldwide also use. The course ends with RISC and pipeline processing. [last updated January 2024]	-v processor struct	ture, cache,
B3B01KAT1	Complex Analysis and Transformations	Z,ZK	6
B3B02FY1A	Physics 1	Z,ZK	7
	physics at the Faculty of Electrical Engineering - Physics 1, is devoted to the introduction into two important areas of physics. The first		-
	is the electric and magnetic field. Within the framework of the classical mechanics, the students study the particle kinematics; dynamic		II.
of mass particles a	nd rigid bodies. The students should be able to solve basic problems dealing with the description of mechanical systems, which they	can meet during th	heir further
	al mechanics is followed by the relativistic mechanics, electric and magnetic field - both stationary as well as non-stationary. The students are the statement of the statement		٠ ا
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
D2D02EV2	consecutive course Physics 2.	7 7V	6
B3B02FY2	Physics 2 s 2 is closely linked with the course Physics 1. Within the framework of this course the students will first of all learn foundations of the	Z,ZK	6
-	es - will give to the students basic insight into the properties of waves and will help to the students to understand that the presented of	-	
universal characte	er in spite of the waves character. Particular types of waves, such as acoustic or optical waves are the subjects of the following section	n. Quantum mech	anics 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,			
	puter vision, measuring technique and will allow them to understand the principles of novel technologies and functioning of new elec		
B3B04PRE	Presentation Skills	KZ	2
B3B14EPR1	Electric Drives for Automation and Robotics	Z,ZK	6
	urse is to understand the basic principles of rotating machines, to gain an overview of their properties and capabilities, control metho		
influence of the load on the drive. The course provides a brief overview of the basic types of electric drives. It deals with drives that are used as servo drives, ie DC, asynchronous, synchronous with permanent magnets and marginally special motors. The course discusses the topologies of power electronic converters, including basic modulation strategies and			
strategies for the control of servo drives such as vector, direct, MTPA control with emphasis on today's most commonly used PMSM motors. The course is focused not only on			
_	hysical nature of the type of drive, but also on understanding the principles of operation of other important components such as sens		
and digital controlle	ers themselves. It also includes a description of the interaction of the drive with the inertial mass of the load in servomechanisms and	other typical types	s of load in
	general.		

B3B31EPO Electronic Devices and Circuits Z,ZK 6 The course introduces students to the basic principles and methods of analysis of electrical circuits. Defines the circuit elements and gives their elementary application. It deals with the basic fundaments of electronic systems based on analog as well as digital circuits. The course presents operational principles and methods of analysis of these circuits with respect to the use of cybernetics and control systems. B3B31SSI Z,ZK Signals, systems and inference 6 B3B33ALP Z.ZK 6 Algorithms and Programming This subject will give students a basic understanding of algorithms and programming and teach them to design, implement and test algorithms for simple tasks. The students will understand the notion of computational complexity. They will learn about basic program building blocks such as loops, conditional statements, variables, functions and recursion. We will introduce the most often used data structures (queue, stack, list, array etc) and operations on them. We will show the basic algorithms, for example for searching and sorting. Students will learn to write simple programs in Python. B3B33KUI Cybernetics and Artificial Intelligence 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 ΚZ 4 During this laboratory courses the students are introduced with the practical robotics through solving of practical tasks. Students are working in laboratories in groups which consist of 3 or 4 members. During the semester, each group of students jointly solve one practical problem in the field of robotics. Tasks are designed to introduce students with robotics (manipulators and mobile robots). The students should utilize the basic knowledge obtained in previous study (eg. mathematics, physics, electronics, software development). Students can select specific task from few tasks with different specialization, which are announced each semester. Tasks differs between semesters. An integral part of the solution of the problem is cooperation and communication in the student team. B3B33ROB1 Robotics Z,ZK 6 B3B33UROB Robot Learning Z,ZK 6 The course teaches deep learning methods on known robotic problems, such as semantic segmenation or reactive motion control. The overall goal is timeless universal knowledge rather than listing all known deep learning architectures. Students are assumed to have working prior knowledge of mathematics (gradient, jacobian, hessian, gradient descend, taylor polynomial) and machine learning (bayes risk minimization, linear classifier). The labs are divided into two parts, in the first one, the students will solve elementary deep ML tasks from scratch (including the reimplementation of autograd backpropagation), in the second one, students will build on existing templates in order to solve complex tasks including RL, tranformers and generative networks. B3B35ARI1 Automatic Control Z,ZK 6 Foundation course of automatic control. Introduction to basic concepts and properties of dynamic systems of physical, engineering, biological, economics, robotics and informatics nature. Basic principles of feedback and its use as a tool for altering the behavior of systems and managing uncertainty. Classical and modern methods for analysis and design of automatic control systems. Students specialized in systems and control will build on these ideas and knowledge in the advanced courses to follow. Students of other branches and programs will find out that control is an inspiring, ubiquitous and entertaining field worth of a future cooperation. Students? creativity is developed in our laboratories. B3B35HSS Humanitní, um lecký a spole enskov dní seminá 4 B3B35JVC K7 How to make (almost) anything 6 B3B35LAR ΚZ Laboratory of applied electronics and control 4 B3B35MSD1 Modeling and simulation of dynamic systems Z,ZK 6 B3B35PAR1 Programming of logic controllers and robots Z,ZK 6 B3B35RO1 4 Robots ΚZ B3B36PRG Programming in C Z,ZK 6 The course targets to gain a deep, comprehensive knowledge of the C programming language in terms of program operation, access and memory management, and the development of multi-threaded applications. The course emphasizes acquiring programming habits for creating readable and reusable programs. Students get acquainted with the compilation of the source codes and their debugging. Lectures are based on the presentation of basic software constructs and demonstration of motivational programs with practical constructs pointing to the readability and structure of source code, real computational complexity, and related tools for profiling and debugging. Students get acquainted with the principles of parallel programming of multi-threaded applications, synchronization mechanisms, and models of multi-threaded applications. At the end of the semester, the basic features of the object-oriented C++ extension are briefly presented. B3B38KDS1 Z.ZK Communication and Distributed Systems 6 The course is devoted to the principles of communication in distributed systems (DS), both in common computer networks and in specialized networks for industrial control and in networks for the Internet of Things. 1. Introduction, basic concepts, ISO / OSI model 2. Systems with distributed parameters, physical channel (metallic, optical and radio) and its properties 3. Communication channel models (AWGN, BSC), narrowband analog and digital modulation 4. Entropy of information source, source and channel coding, channel capacity 5. Codes for error detection and correction (groups and solids, linear and cyclic codes) 6. Information confidentiality, symmetric and asymmetric encryption, key distribution, certificates, digital signature 7. Types of data transmissions, multiplexing, methods of access control to shared media 8. Physical and logical topologies, ARQ methods, heterogeneous distributed systems 9. Industrial distributed systems (IDS), virtual field device, object directory 10. Functional principles of IDS, typical applications and their solutions 11. Computer and LAN networks, functional principles, implementation of real-time functions, time synchronization 12. Wireless LANs and Internet of Things networks 13. TCP / IP family protocols, IP protocol, ARP, DHCP, ICMP, NAT, 14. Transport protocols of the TCP / IP, UDP, TCP, RTP family, data flow control, congestion control Laboratory exercises will be focused on the practical acquisition of theoretical knowledge. They will require home preparation in the form of self-study, subsequent elaboration of a protocol evaluating the measured or otherwise obtained results, their agreement with theoretical assumptions and justifying any differences. The credit project will focus on the practical implementation of data transmission with defined properties in the IP network environment. B3B38LPE1 Laboratories of Industrial Electronics ΚZ B3B38OTE1 Circuit Technologies Z.ZK 6 Students will get acquainted with the basic types of circuits and structural blocks of digital instruments and equipment. Emphasis is placed on the continuity of individual circuits in terms of accuracy in analog or. analog-to-digital circuits. 1. Structure of digital measuring instruments and signal generators 2. Directly coupled amplifiers and attenuators 3. Isolation and modulation amplifiers 4. Circuits for conversion of mean and rms value, peak detectors 5. Circuits for frequency signal conditioning, oscillators, mixers 6. Reference voltage and current sources, sine and function generators 7. Design of strings and channels of analog blocks - signal levels, linearity, interference 8. Switching and coupling circuits 9. Time and amplitude discretization of signal, samplers, errors 10. Advanced analog-to-digital converters 11. Digital-to-analog converters, signal reconstruction 12. Digital circuits for frequency and phase measurement, phase synchronization, direct digital synthesis 13. Circuits for the implementation of interfaces for connection to buses 14. Design of analog and digital part in terms of self-radiation and resistance to interference The laboratory exercises of the first part of the semester take place on suitable universal preparations, enabling students to work with HW in an efficient and at the same time creative way. In the second part of the semester, laboratory exercises will be solved in the form of an individual project, the content of which is the design and implementation of a model of an analog signal preprocessing block and comparison of its properties with a professional product. B3B38SME1 Sensors and Measurement Z.ZK 1. Sampling, D / A and A / D converters, digital oscilloscope 2. Measurement of voltage and current (digital voltmeter and multimeter, analog measuring instruments) measurement of

frequency and phase difference, error and uncertainty, Measurement of effective value, power and energy consumption 3. Resistance measurement, resistance temperature and

deformation sensors. Low voltage measurement, thermocouple temperature measurement 4. Magnetic sensors, magnetic measurements, voltage and current transformer Sensors el. Proudu. Impedance measurement 5 Capacitive and inductive sensors Measurement of linear and angular position - magnetic and optoelectronic sensors 6. sensors for measuring speed and speed, sensors and transducers for measuring acceleration. Vibration measurement 7 Temperature measurement by contact sensors 8. Non-contact temperature measurement 9. Measurement of force and pressure. Level measurement 10. Flow and level measurement 11. Measuring systems, sensor buses. Logic analyzer 12. Other measuring instruments, standards of electrical quantities 13. Chemical sensors 14. Repetition, solution of test examples B3B38VSY1 **Embedded Systems** Z.ZK

solve two smaller and two larger vest projects. system with a microcontroller and other electronic blocks on a solderless contact field. Projects include program and circuit implementation.			
B3BPROJ5	Bachelor project	Z	5
BBAP20	Bachelor thesis	Z	20
BEZB	Safety in Electrical Engineering for a Bachelor's Degree	Z	0

The course is focused on the means, components and solutions of embedded systems, with microcontrollers with ARM Cortex-M core. After introductory tasks within the lab. students

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.			

TV-V1 Physical education Ζ 1 TVKLV 0 Physical Education Course Ζ TVKZV Z 0 Physical Education Course Ζ TVV Physical education 0 TVV0 Z 0

Physical education

For updated information see http://bilakniha.cvut.cz/en/f3.html Generated: day 2025-11-07, time 23:51.