

Study plan

Name of study plan: Open Informatics - Internet of Things 2018

Faculty/Institute/Others: Faculty of Electrical Engineering
 Department:
 Branch of study guaranteed by the department: Welcome page
 Garantor of the study branch:
 Program of study: Open Informatics
 Type of study: Bachelor full-time
 Required credits: 152
 Elective courses credits: 28
 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: 122
 The role of the block: P

Code of the group: 2018_BOIBAP
 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 Mejla (Gar.)	Z	20	12S	L,Z	P

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

BBAP20	Bachelor thesis	Z	20
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Code of the group: 2018_BOIBBE
 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 Vladimír K la, Ivana Nová, Radek Havlí ek Radek Havlí ek Vladimír K la (Gar.)	Z	0	2BP+2BC	Z,L	P
BEZZ	Basic health and occupational safety regulations Vladimír K la, Ivana Nová, Radek Havlí ek Radek Havlí ek Vladimír K la (Gar.)	Z	0	2BP+2BC	Z	P

Characteristics of the courses of this group of Study Plan: Code=2018_BOIBBE Name=Safety of the bachelor's studies

BEZB	Safety in Electrical Engineering for a bachelor's degree 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.	Z	0
BEZZ	Basic health and occupational safety regulations 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.	Z	0

Code of the group: 2018_BOIP

Name of the group: Compulsory subjects of the programme

Requirement credits in the group: In this group you have to gain 102 credits

Requirement courses in the group: In this group you have to complete 17 courses

Credits in the group: 102

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
B4B33ALG	Algorithms Marko Genyk-Berezovskij, Daniel Pr ša Marko Genyk-Berezovskij Marko Genyk-Berezovskij (Gar.)	Z,ZK	6	2P+2C	Z	P
B0B35APO	Computer Architectures Pavel Píša, Richard Šusta, Petr Št pán Pavel Píša Pavel Píša (Gar.)	Z,ZK	5	2P+2L	L	P
B0B36DBS	Database Systems Martin imná Martin imná Martin imná (Gar.)	Z,ZK	6	2P+2C+4D	L	P
B4B01DMA	Discrete Mathematics Petr Habala Petr Habala Petr Habala (Gar.)	Z,ZK	5	2P+2S	Z	P
B0B01LAG	Linear Algebra Ji í Velebil, Daniel Gromada, Josef Dvo ák, Mat j Dostál Ji í Velebil Ji í Velebil (Gar.)	Z,ZK	8	4P+2S	Z	P
B0B01LGR	Logic and Graphs Mat j Dostál, Alena Gollová Alena Gollová Marie Demlová (Gar.)	Z,ZK	5	3P+2S	Z,L	P
B0B01MA1	Mathematical Analysis 1 Josef Dvo ák, Karel Pospíšil, Josef Tkadlec Josef Tkadlec Josef Tkadlec (Gar.)	Z,ZK	7	4P+2S	Z,L	P
B0B01MA2	Mathematical Analysis 2 Paola Vivi, Karel Pospíšil, Petr Hájek, Jaroslav Tišer, Miroslav Korbela, Martin K epela, Zden k Mihula, Martin Bohata, Natalie Žukovec Petr Hájek Jaroslav Tišer (Gar.)	Z,ZK	7	4P+2S	L,Z	P
B4B35OSY	Operating Systems Petr Št pán, Michal Sojka Michal Sojka Michal Sojka (Gar.)	Z,ZK	4	2P+2C	Z	P
B0B33OPT	Optimization Tomáš Werner, Petr Olšák, Lukáš Adam, Tomáš Kroupa Tomáš Werner Tomáš Werner (Gar.)	Z,ZK	7	4P+2C	Z,L	P
B4B36PDV	Parallel and Distributed Computing Jakub Mare ek, Michal Jakob Michal Jakob Michal Jakob (Gar.)	Z,ZK	6	2P+2C	L	P
B4B38PSIA	Computer Networks Ji í Novák, Jan Holub Ji í Novák Ji í Novák (Gar.)	Z,ZK	5	2P+2L	L	P
B0B01PST	Probability and Statistics Miroslav Korbela, Mirko Navara, Kate ina Helisová, Veronika Sobotíková Kate ina Helisová Petr Hájek (Gar.)	Z,ZK	7	4P+2S	Z,L	P
B0B36PRP	Procedural Programming Jan Faigl Jan Faigl Jan Faigl (Gar.)	Z,ZK	6	2P+2C	Z	P
B0B36PJV	Programming in Java Ji í Vok ínek Ji í Vok ínek Ji í Vok ínek (Gar.)	Z,ZK	6	2P+3C+7D	L	P
B4B33RPH	Solving Problems and other Games Tomáš Svoboda, Petr Pošík Tomáš Svoboda Tomáš Svoboda (Gar.)	KZ	6	2P+3C	Z	P
B4BPROJ6	Unassisted project Tomáš Svoboda, Petr Pošík, Ji í Šebek, Jaroslav Sloup, Ivan Jelínek, Katarína Komendová Petr Pošík	Z	6	0+2		P

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

B4B33ALG	Algorithms	Z,ZK	6
In the course, the algorithms development is constructed with minimum dependency to programming language; nevertheless the lectures and seminars are based on Java. Basic data types a data structures, basic algorithms, recursive functions, abstract data types, stack, queues, trees, searching, sorting, special application algorithms, Dynamic programming. Students are able to design and construct non-trivial algorithms and to evaluate their effectivity.			
B0B35APO	Computer Architectures	Z,ZK	5
B0B36DBS	Database Systems	Z,ZK	6
The course is designed as a basic database course mainly aimed at the student ability to design a relational data model and to use the SQL language for data definition as well as for data querying and to choose the appropriate degree of transaction isolation. Students will also get acquainted with the most commonly used indexing techniques, database system architecture and their management. They will verify their knowledge during the elaboration of a continuously submitted seminar task.			
B4B01DMA	Discrete Mathematics	Z,ZK	5
In this course students meet some important topics from the field of discrete mathematics. Namely, they will explore divisibility and calculations modulo n, diophantine equations, binary relations, mappings, cardinality of sets, induction, and recurrence equations. The second aim of this course is to teach students the language of mathematics, both passively and actively, and introduce them to mathematics as science.			
B0B01LAG	Linear Algebra	Z,ZK	8
The course covers the initial parts of linear algebra. Firstly, the basic notions of a linear space and linear mappings are covered (linear dependence and independence, basis, coordinates, etc). The calculus of matrices (determinants, inverse matrices, matrices of a linear map, eigenvalues and eigenvectors, diagonalisation, etc) is covered next. The applications include solving systems of linear equations, the geometry of a 3D space (including the scalar product and the vector product) and SVD.			
B0B01LGR	Logic and Graphs	Z,ZK	5
This course covers basics of mathematical logic and graph theory. Syntax and semantics of propositional and predicate logic are introduced. The importance of the notion of semantic consequence and of the relationship between a formula and its model is stressed. Further, basic notions from graph theory are introduced.			

B0B01MA1	Mathematical Analysis 1 The aim of the course is to introduce students to basics of differential and integral calculus of functions of one variable.	Z,ZK	7
B0B01MA2	Mathematical Analysis 2 The subject covers an introduction to the differential and integral calculus in several variables and basic relations between curve and surface integrals. Other part contains function series and power series with application to Taylor and Fourier series.	Z,ZK	7
B4B35OSY	Operating Systems Lecture introduces operation system's basic concepts and principles as processes, threads, communication and synchronization, virtual memory, drivers, file systems, basic security aspects. These topics are theoretically described and demonstrated on Linux and Windows OS with multi-core systems. Practical exercises from OS in C programming language will be solved on labs. Students will work with Linux OS and micro-kernel NOVA.	Z,ZK	4
B0B33OPT	Optimization The course provides the basics of mathematical optimization: using linear algebra for optimization (least squares, SVD), Lagrange multipliers, selected numerical algorithms (gradient, Newton, Gauss-Newton, Levenberg-Marquardt methods), linear programming, convex sets and functions, intro to convex optimization, duality.	Z,ZK	7
B4B36PDV	Parallel and Distributed Computing	Z,ZK	6
B4B38PSIA	Computer Networks	Z,ZK	5
B0B01PST	Probability and Statistics 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.	Z,ZK	7
B0B36PRP	Procedural Programming P edm t provádí základními rysy procedurálního programování s d razem na pam ovou reprezentaci dat v pam ti po íta e. Dále jsou rozvíjeny koncepty spojových datových struktur a zpracování uživatelského vstupu. V p edm tu je kladen d raz na osvojení si programovacích návyk pro vytvá ení ítelných a znovu použitelných program . Zárove je snahou vybudovat u student náhled nad fungováním programu, datového modelu, p ístupem a správou pam ti. Proto je ve výuce využít programovací jazyk C, který poskytuje p ímou vazbou mezi programem a alokovaným pam ovým prostorem. Studentky a studenti se v p edm tu seznámí nejen s p ekladem zdrojových kód a linkováním aplikace, ale také s lad ním a profilováním programu. Cvi ení jsou cílena na osvojení si praktických dovedností implementace samostatných jednoduchých úkol s d razem na funk nost a správnost implementací. Samostatnost je rozvíjena v domácích úkolech s možností realizace volitelných a bonusových úkol . Záv re ny úkol je integra ní úloha v tšího rozsahu. U vybraných úkol je sou ástí hodnocení kódovacího stylu motivované psaním ítelných, srozumitelných a udržovatelných kód .	Z,ZK	6
B0B36PJV	Programming in Java The course builds on the basics of algorithms and programming from the first semester and introduces students to the Java environment. The course also focus on the object concept of the Java language. The topics of the course includes exceptions, event handling, and building a graphical interface. Basic library methods, working with files and using generic types will be introduced. An important topic is models of multithreaded applications and their implementation. Practical exercises of practical skills and knowledge of Java is tested in the form of solving partial tasks and semester work, which will be submitted continuously through the source code version control system. The semester work scoring consists of points for the correctness and efficiency of the code, as well as points that take into account the quality of the source codes, their readability and reusability.	Z,ZK	6
B4B33RPH	Solving Problems and other Games The main motivation is to let students to deal with real-world problems properly. When working on real problems the student shall learn how to decompose the big problem, how to define interfaces, how to test and validate individual steps and so on. Many problems will actually be beyond the first-year-student skills. And many problem will not be solved in the optimal way. The unsolved parts should motivate the students to study difficult theoretical subjects. They should generate the important questions. Ideally, at the end of the subject, the student should be eager to study deeper about informatics. The course also explains the basis of the object oriented design, software testing, ways for writing readable and robust codes.	KZ	6
B4BPROJ6	Unassisted project	Z	6

Code of the group: 2015_BZAJ

Name of the group: Exam from the english language

Requirement credits in the group:

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

Credits in the group: 0

Note on the group:

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

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

B0B04B1K	English language B1 - classified assessment verifying of the student's skills of B1 level	KZ	0
B0B04B2Z	English language B2 - exam 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 the department website: http://jazyky.fel.cvut.cz/	Z,ZK	0

Name of the block: Povinné předměty zaměřené
 Minimal number of credits of the block: 30
 The role of the block: PZ

Code of the group: 2018_BOIPS2

Name of the group: Compulsory subjects of the branch

Requirement credits in the group: In this group you have to gain 30 credits

Requirement courses in the group: In this group you have to complete 5 courses

Credits in the group: 30

Note on the group: Specializace - Internet věci

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
B4B17EAM	Electromagnetism Zbyněk Škvor, Pavel Hazdra Jan Krajek Zbyněk Škvor (Gar.)	Z,ZK	6	2P+2C	Z	PZ
B0B35LSP	Logic systems and processors Richard Šusta, Martin Hlinovský Martin Hlinovský Richard Šusta (Gar.)	Z,ZK	6	3P+2L	Z,L	PZ
B4B38NVS	Embedded Systems Design Vojtěch Petrucha, Jan Fischer Jan Fischer Vojtěch Petrucha (Gar.)	Z,ZK	6	2P+2L	Z	PZ
B4B32PKS	Computer and Communication Networks Leoš Boháč, Tomáš Vaněk Ivan Pravda Leoš Boháč (Gar.)	Z,ZK	6	2P + 2C	L	PZ
B4B35PSR	Real-time Systems Programming Michal Sojka Michal Sojka Michal Sojka (Gar.)	Z,ZK	6	2P+2C	Z	PZ

Characteristics of the courses of this group of Study Plan: Code=2018_BOIPS2 Name=Compulsory subjects of the branch

B4B17EAM	Electromagnetism	Z,ZK	6	Based on theoretical fundamentals such as Maxwell equations, students will acquire insight into electromagnetic effects and ability to solve simple electromagnetic problems. Physical principles are applied to derive basics of circuit theory. Simple linear circuits, lumped as well as distributed, are described and analysed. Field theory application enables to understand basic circuit elements, such as resistors, capacitors, inductors, and transmission lines as well as important effects such as resonance and impedance matching. Exact quantitative description (analysis and/or design) of simple geometries helps to estimate fields and behaviour of more complex ones. Frequency domain and time domain formulations are combined to provide better insight. The course is completed by information on electromagnetic compatibility.
B0B35LSP	Logic systems and processors	Z,ZK	6	The course is an introduction to basic hardware structures of computing resources, their design, and architecture. It provides an overview of the implementation of data operations at hardware and the creation of embedded processor systems with peripherals on advanced programmable logic FPGAs.
B4B38NVS	Embedded Systems Design	Z,ZK	6	The course deals with design of embedded systems using ARM based microcontrollers.
B4B32PKS	Computer and Communication Networks	Z,ZK	6	The aim of the course is to familiarize students with current trends in the switched local networks and the key functions of routing protocols in IP networks. The second part of the course introduces students to concepts of ensuring the information security in the communication networks. An integral part of the course is also an explanation of the principles for ensuring the adequate quality of services in data networks and features of some file sharing application protocols. The course is aimed rather primarily practically than theoretically.
B4B35PSR	Real-time Systems Programming	Z,ZK	6	The goal of this course is to provide students with basic knowledge about software development for real-time systems, for example in control and embedded applications. The main focus is on embedded systems equipped with a real-time operating system (RTOS). Lectures will cover real-time systems theory, which can be used to formally verify timing correctness such systems. Another set of lectures will introduce methods and techniques used for development of safety-critical systems, whose failure may have catastrophic consequences. During labs, students will first solve a few simple tasks to familiarize them with basic components of VxWorks RTOS and to benchmark the used OS and hardware (Xilinx Zynq). The obtained metrics represent the typical criteria for assessing the suitability of a given platform for the given application. After the simple tasks, students will solve complex task of time-critical motion control application which will require full utilization of RTOS features. All the tasks at the labs will be implemented in C (or C++) language.

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 0

The role of the block: PV

Code of the group: 2018_BOIAPP

Name of the group: Subjects in english

Requirement credits in the group:

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

Credits in the group: 0

Note on the group: ~Studenti programu Otevřená informatika musí v bakalářském studiu projít alespoň jedním anglicky přednášeným povinným předmětem programu či oboru. Bližší podmínky jsou uvedeny na stránce <https://oi.fel.cvut.cz/cs/bakalarsky-program> (sekce Jazyková příprava). Níže je uveden seznam doporučených předmětů, kterými můžete tuto povinnost splnit. Pokud je česká varianta součástí vašeho povinného studijního plánu, pochopitelně vám anglická varianta nahradí tuto českou. Kromě uvedeného seznamu lze povinnost splnit zápisem anglicky přednášeného předmětu na zahraniční stáži (Erasmus, apod.). V obou výše uvedených

případech bude povinnost v KOSu splněna automaticky. Poslední možností je splnit tuto povinnost na žádost jinak (předmět mimo seznam, bakalářská práce vedená zahraničním vedoucím, apod.)\ \

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
BE4B33SEA	Subject in english - abroad	Z,ZK	0		Z,L	PV
BE5B32PKS	Computer and Communication Networks <i>Leoš Bohá , Tomáš Van k, Pavel Bezpalec Zbyn k Kocur Leoš Bohá (Gar.)</i>	Z,ZK	6	2P + 2C	Z	PV
BE5B35APO	Computer Architectures <i>Pavel Píša, Richard Šusta Pavel Píša Pavel Píša (Gar.)</i>	Z,ZK	6	2P+2L	L	PV
BE4B38PSIA	Computer Networks <i>Ji í Novák, Jan Holub Ji í Novák Ji í Novák (Gar.)</i>	Z,ZK	5	2P+2L	L	PV
BE4B36FUP	Functional Programming <i>Rostislav Hor ík, Michal P chou ek Michal P chou ek Michal P chou ek (Gar.)</i>	Z,ZK	6	2P+2C	L	PV
BE4B36ZUI	Introduction to Artificial Intelligence <i>Michal P chou ek, Branislav Bošanský, Viliam Lisý Branislav Bošanský Branislav Bošanský (Gar.)</i>	Z,ZK	6	2P+2C	L	PV
BE5B35LSP	Logic Systems and Processors <i>Richard Šusta Richard Šusta Richard Šusta (Gar.)</i>	Z,ZK	6	3P+2L	Z	PV
BE5B33RPZ	Pattern Recognition and Machine Learning <i>Ond ej Drbohlav, Ji í Matas, Jan Šochman Ji í Matas Ji í Matas (Gar.)</i>	Z,ZK	6	2P+2C	Z	PV
BE4B39VGO	Creating graphic content <i>Ladislav molík Ladislav molík Ladislav molík (Gar.)</i>	Z,ZK	6	2P+2C+8D	Z	PV

Characteristics of the courses of this group of Study Plan: Code=2018_BOIAPP Name=Subjects in english

BE4B33SEA	Subject in english - abroad The subject serves for validation of the duty to complete at least one compulsory course of the program in English.	Z,ZK	0
BE5B32PKS	Computer and Communication Networks The aim of the course is to familiarize students with current trends in the switched local networks and the key functions of routing protocols in IP networks. The course is aimed rather primarily practically than theoretically.	Z,ZK	6
BE5B35APO	Computer Architectures Subject provides overview of basic building blocks of computer systems. Explanation starts from hardware side where it extends knowledge presented in the previous lectures of Structures of computer systems. Topics cover building blocks description, CPU structure, multiple processors interconnections, input/output subsystem and basic overview of network and buses topologies. Emphasis is placed on clarification of interconnection of hardware components with software support, mainly lower levels of operating systems, device drivers and virtualization techniques. General principles are more elaborated during presentation of examples of multiple standard CPU architectures. Exercises are more focused on the software view to the contrary. Students are lead from basic programming on CPU level to the interaction with raw hardware.	Z,ZK	6
BE4B38PSIA	Computer Networks Subject is devoted to principles and technologies of Computer Networks. Physical layer media, analog and digital modulations, network topologies, MAC methods, ARQ algorithms, data communication models, coding and cryptography basics are introduced. Widely used LAN technologies are then presented together with their features. Internet protocols are explained and internetworking approaches are presented.	Z,ZK	5
BE4B36FUP	Functional Programming This course introduces students into the techniques of functional programming, the advantages and disadvantages of this programming paradigm, and its use in practice. This approach is declarative in the sense that the programmer symbolically describes the problem to be solved, rather than specifying the exact sequence of operations required to solve it. It allows focusing on the essence of the solved problem and implementing even more complex algorithms compactly. Functional programming has notable advantages for parallelization and automated verification of algorithms, and the most useful functional programming concepts are increasingly often introduced to standard programming languages. Because of the focus of functional programming on symbols, rather than numbers, functional programming has been heavily used in artificial intelligence fields, such as agent systems or symbolic machine learning.	Z,ZK	6
BE4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6
BE5B35LSP	Logic Systems and Processors The course is an introduction to basic hardware structures of computing resources, their design, and architecture. It provides an overview of the implementation of data operations at hardware and the creation of embedded processor systems with peripherals on advance programmable logic FPGAs.	Z,ZK	6
BE5B33RPZ	Pattern Recognition and Machine Learning 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.	Z,ZK	6
BE4B39VGO	Creating graphic content The aim of this course is to give to students an overview of methods to create 2D and 3D graphics content and how to apply those methods in praxis. Students will learn how to design and create three-dimensional scene, create and apply textures imitating materials (e.g., wall finishes, wood, sky) and geometrical details, and position and set-up lights in the scene. Student will also learn the terminology used in computer graphics.	Z,ZK	6

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_BOIH

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 Sláma ka Vladimír Sláma ka Vladimír Sláma ka (Gar.)	KZ	4	2P+2C	Z	v
B0B16FIL	Philosophy Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.)	ZK	2	2P+0S	Z,L	v
B0B16F11	Philosophy 1 Peter Zamarovský Peter Zamarovský Peter Zamarovský (Gar.)	KZ	4	2P+2S	Z	v
B0B16HTE	History of technology and economic Marcela Efmertová, Jan Mikeš Marcela Efmertová Marcela Efmertová (Gar.)	ZK	2	2P+0S	Z,L	v
B0B16HT1	History of science and technology 1 Marcela Efmertová, Jan Mikeš Marcela Efmertová Marcela Efmertová (Gar.)	KZ	4	2P+2S	Z	v
B0B16HI1	History 1 Milena Josefovi ová 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 Jan Fiala (Gar.)	ZK	2	2P+0S	Z,L	v

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

B0B16ET1	Ethic 1	KZ	4	Aim of this subject is to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situations of human life. Essential parts of the subject are discussions in which students can react to lectures but also to actual questions coming with news and look for the communal answers.		
B0B16FIL	Philosophy	ZK	2	We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.		
B0B16F11	Philosophy 1	KZ	4	We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.		
B0B16HTE	History of technology and economic	ZK	2			
B0B16HT1	History of science and technology 1	KZ	4			
B0B16HI1	History 1	KZ	4			
B0B16MPS	Psychology	Z,ZK	4			
B0B16MPL	Psychology for managers	ZK	2			

Code of the group: 2015_BJKA

Name of the group: English language courses

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

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

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

B0B04A21	English Language A2-1	Z		The course is open to students who are beginners in their second language. Course objective: Achieving competence in basic English.		
B0B04A22	English Language A2-2	Z	0	The course is open to students who are beginners in their second foreign language. The course objective is to develop and sustain their basic knowledge of the English language.		
B0B04B11	English Language B1-1	Z	0	Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.		

B0B04B12	English Language B1-2	Z	0
Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.			
B0B04B21	English Language B2-1	Z	3
This course is designed as a full-year, two semester preparation course for the university's compulsory B2-level English Examination (Anglický jazyk B2 - zkouška - B0B04B2Z*). While the course is focused on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark), it also focuses more on the academic and technical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate level of English for Erasmus / International Study.			
B0B04B22	English Language B2-2	Z	3
This course is designed as a full-year, two semester preparation course for the university's 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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
TVV	Physical education	Z	0	0+2	Z,L	v
A003TV	Physical Education	Z	2	0+2	L,Z	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
A003TV	Physical Education	Z	2
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:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
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: 2018_BOIVOL

Name of the group: Elective subjects

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

~Nabídku volitelných předmětů uspořádaných podle kateder najdete na webových stránkách
<http://www.fel.cvut.cz/cz/education/volitelne-predmety.html>

List of courses of this pass:

Code	Name of the course	Completion	Credits
A003TV	Physical Education	Z	2
B0B01LAG	Linear Algebra	Z,ZK	8
The course covers the initial parts of linear algebra. Firstly, the basic notions of a linear space and linear mappings are covered (linear dependence and independence, basis, coordinates, etc). The calculus of matrices (determinants, inverse matrices, matrices of a linear map, eigenvalues and eigenvectors, diagonalisation, etc) is covered next. The applications include solving systems of linear equations, the geometry of a 3D space (including the scalar product and the vector product) and SVD.			
B0B01LGR	Logic and Graphs	Z,ZK	5
This course covers basics of mathematical logic and graph theory. Syntax and semantics of propositional and predicate logic are introduced. The importance of the notion of semantic consequence and of the relationship between a formula and its model is stressed, Further, basic notions from graph theory are introduced.			
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 an introduction to the differential and integral calculus in several variables and basic relations between curve and surface integrals. Other part contains function series and power series with application to Taylor and Fourier series.			
B0B01PST	Probability and Statistics	Z,ZK	7
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.			
B0B04A21	English Language A2-1	Z	
The course is open to students who are beginners in their second language. Course objective: Achieving competence in basic English.			
B0B04A22	English Language A2-2	Z	0
The course is open to students who are beginners in their second foreign language. The course objective is to develop and sustain their basic knowledge of the English language.			
B0B04B11	English Language B1-1	Z	0
Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.			
B0B04B12	English Language B1-2	Z	0
Course objective: Broadening the basic knowledge of general English; mastering basic specialised language; focusing on text analysis and vocabulary expansion; understanding spoken English.			
B0B04B1K	English language B1 - classified assessment	KZ	0
verifying of the student's skills of B1 level			
B0B04B21	English Language B2-1	Z	3
This course is designed as a full-year, two semester preparation course for the university's compulsory B2-level English Examination (Anglický jazyk B2 - zkouška - B0B04B2Z*). While the course is focused on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark), it also focuses more on the academic and technical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate level of English for Erasmus / International Study.			
B0B04B22	English Language B2-2	Z	3
This course is designed as a full-year, two semester preparation course for the university's compulsory B2-level English Examination (Anglický jazyk B2 - zkouška - B0B04B2Z*). While the course is focused on helping students reach a level required to pass the B2-level English Examination (or improve their English for a higher mark), it also focuses more on the academic and technical vocabulary and grammar expected of students at the university level. *NOTE: This exam is also used for determining an appropriate level of English for Erasmus / International Study.			
B0B04B2Z	English language B2 - exam	Z,ZK	0
I) The B2 English Exam is a compulsory subject for all Faculty of Electrical Engineering students at the Czech Technical University. According to the Study and Examination Rules and Regulations for Students at CTU (Part III, Article 4), a compulsory subject is one "whose completion is a necessary condition in order to successfully complete the study programme." In addition, this requires the "passing of an examination evaluated on the scale A, B, C, D, or E..." (SERR Part III, Article 6). II) According to the Common European Framework of Reference for Languages (CEFR), an international standard for describing language ability, the definition of an English language learner who has achieved the B2 (Upper-Intermediate) level is one who "...can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options." III) Students who have successfully passed an approved international exam within the past five years may present their certificate to the Department of Languages, Faculty of Electrical Engineering. Upon approval, students are then exempt from both the Written Test and the Oral Part. For a list of approved international exams go the department website: http://jazyky.fel.cvut.cz/			
B0B16ET1	Ethic 1	KZ	4
Aim of this subject is to provide the students an orientation not only in general problems of ethics but above all to offer instructions for solving various situations of human life. Essential parts of the subject are discussions in which students can react to lectures but also to actual questions coming with news and look for the communal answers.			
B0B16FI1	Philosophy 1	KZ	4
We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.			
B0B16FIL	Philosophy	ZK	2
We deal with the most important persons, schools and ideas of ancient philosophy. We are concerned especially on transdisciplinary nature of philosophy and connection of old philosophical thoughts with recent problems of science, technology, economics and politics.			
B0B16HI1	History 1	KZ	4
B0B16HT1	History of science and technology 1	KZ	4
B0B16HTE	History of technology and economic	ZK	2
B0B16MPL	Psychology for managers	ZK	2
B0B16MPS	Psychology	Z,ZK	4

B0B33OPT	Optimization	Z,ZK	7
The course provides the basics of mathematical optimization: using linear algebra for optimization (least squares, SVD), Lagrange multipliers, selected numerical algorithms (gradient, Newton, Gauss-Newton, Levenberg-Marquardt methods), linear programming, convex sets and functions, intro to convex optimization, duality.			
B0B35APO	Computer Architectures	Z,ZK	5
B0B35LSP	Logic systems and processors	Z,ZK	6
The course is an introduction to basic hardware structures of computing resources, their design, and architecture. It provides an overview of the implementation of data operations at hardware and the creation of embedded processor systems with peripherals on advance programmable logic FPGAs.			
B0B36DBS	Database Systems	Z,ZK	6
The course is designed as a basic database course mainly aimed at the student ability to design a relational data model and to use the SQL language for data definition as well as for data querying and to choose the appropriate degree of transaction isolation. Students will also get acquainted with the most commonly used indexing techniques, database system architecture and their management. They will verify their knowledge during the elaboration of a continuously submitted seminar task.			
B0B36PJV	Programming in Java	Z,ZK	6
The course builds on the basics of algorithms and programming from the first semester and introduces students to the Java environment. The course also focus on the object concept of the Java language. The topics of the course includes exceptions, event handling, and building a graphical interface. Basic library methods, working with files and using generic types will be introduced. An important topic is models of multithreaded applications and their implementation. Practical exercises of practical skills and knowledge of Java is tested in the form of solving partial tasks and semester work, which will be submitted continuously through the source code version control system. The semester work scoring consists of points for the correctness and efficiency of the code, as well as points that take into account the quality of the source codes, their readability and reusability.			
B0B36PRP	Procedural Programming	Z,ZK	6
P edm t provází základními rysy procedurálního programování s d razem na pam ovou reprezentaci dat v pam ti po íta e. Dále jsou rozvíjeny koncepty spojových datových struktur a zpracování uživatelského vstupu. V p edm tu je kladen d raz na osvojení si programovacích návyků pro vytvá ení ítelných a znovu použitelných program . Zárove je snahou vybudovat u student nadhled nad fungováním programu, datového modelu, p ístupem a správou pam ti. Proto je ve výuce využít programovací jazyk C, který poskytuje p ímou vazbu mezi programem a alokovaným pam ovým prostorem. Studentky a studenti se v p edm tu seznámí nejen s p ekladem zdrojových kód a linkováním aplikace, ale také s lad ním a profilováním programu. Cvi ení jsou cílena na osvojení si praktických dovedností implementace samostatných jednoduchých úkol s d razem na funk nost a správnost implementací. Samostatnost je rozvíjena v domácích úkolech s možností realizace volitelných a bonusových úkol . Záv re ný úkol je integra ní úloha v tšího rozsahu. U vybraných úkol je sou ástí hodnocení kódovacího stylu motivované psaním ítelných, srozumitelných a udržitelných kód .			
B4B01DMA	Discrete Mathematics	Z,ZK	5
In this course students meet some important topics from the field of discrete mathematics. Namely, they will explore divisibility and calculations modulo n, diophantine equations, binary relations, mappings, cardinality of sets, induction, and recurrence equations. The second aim of this course is to teach students the language of mathematics, both passively and actively, and introduce them to mathematics as science.			
B4B17EAM	Electromagnetism	Z,ZK	6
Based on theoretical fundamentals such as Maxwell equations, students will acquire insight into electromagnetic effects and ability to solve simple electromagnetic problems. Physical principles are applied to derive basics of circuit theory. Simple linear circuits, lumped as well as distributed, are described and analysed. Field theory application enables to understand basic circuit elements, such as resistors, capacitors, inductors, and transmission lines as well as important effects such as resonance and impedance matching. Exact quantitative description (analysis and/or design) of simple geometries helps to estimate fields and behaviour of more complex ones. Frequency domain and time domain formulations are combined to provide better insight. The course is completed by information on electromagnetic compatibility.			
B4B32PKS	Computer and Communication Networks	Z,ZK	6
The aim of the course is to familiarize students with current trends in the switched local networks and the key functions of routing protocols in IP networks. The second part of the course introduces students to concepts of ensuring the information security in the communication networks. An integral part of the course is also an explanation of the principles for ensuring the adequate quality of services in data networks and features of some file sharing application protocols. The course is aimed rather primarily practically then theoretically			
B4B33ALG	Algorithms	Z,ZK	6
In the course, the algorithms development is constructed with minimum dependency to programming language; nevertheless the lectures and seminars are based on Java. Basic data types a data structures, basic algorithms, recursive functions, abstract data types, stack, queues, trees, searching, sorting, special application algorithms, Dynamic programming. Students are able to design and construct non-trivial algorithms and to evaluate their effectivity.			
B4B33RPH	Solving Problems and other Games	KZ	6
The main motivation is to let students to deal with real-world problems properly. When working on real problems the student shall learn how to decompose the big problem, how to define interfaces, how to test and validate individual steps and so on. Many problems will actually be beyond the first-year-student skills. And many problem will not be solved in the optimal way. The unsolved parts should motivate the students to study difficult theoretical subjects. They should generate the important questions. Ideally, at the end of the subject, the student should be eager to study deeper about informatics. The course also explains the basis of the object oriented design, software testing, ways for writing readable and robust codes.			
B4B35OSY	Operating Systems	Z,ZK	4
Lecture introduces operation system's basic concepts and principles as processes, threads, communication and synchronization, virtual memory, drivers, file systems, basic security aspects. These topics are theoretically described and demonstrated on Linux and Windows OS with multi-core systems. Practical exercises from OS in C programming language will be solved on labs. Students will work with Linux OS and micro-kernel NOVA.			
B4B35PSR	Real-time Systems Programming	Z,ZK	6
The goal of this course is to provide students with basic knowledge about software development for real-time systems, for example in control and embedded applications. The main focus is on embedded systems equipped with a real-time operating system (RTOS). Lectures will cover real-time systems theory, which can be used to formally verify timing correctness such systems. Another set of lectures will introduce methods and techniques used for development of safety-critical systems, whose failure may have catastrophic consequences. During labs, students will first solve a few simple tasks to familiarize them with basic components of VxWorks RTOS and to benchmark the used OS and hardware (Xilinx Xynq). The obtained metrics represent the typical criteria for assessing the suitability of a given platform for the given application. After the simple tasks, students will solve complex task of time-critical motion control application which will require full utilization of RTOS features. All the tasks at the labs will be implemented in C (or C++) language.			
B4B36PDV	Parallel and Distributed Computing	Z,ZK	6
B4B38NVS	Embedded Systems Design	Z,ZK	6
The course deals with design of embedded systems using ARM based microcontrollers.			
B4B38PSIA	Computer Networks	Z,ZK	5
B4BPROJ6	Unassisted project	Z	6
BBAP20	Bachelor thesis	Z	20
BE4B33SEA	Subject in english - abroad	Z,ZK	0
The subject serves for validation of the duty to complete at least one compulsory course of the program in English.			
BE4B36FUP	Functional Programming	Z,ZK	6
This course introduces students into the techniques of functional programming, the advantages and disadvantages of this programming paradigm, and its use in practice. This approach is declarative in the sense that the programmer symbolically describes the problem to be solved, rather than specifying the exact sequence of operations required to solve it. It allows			

focusing on the essence of the solved problem and implementing even more complex algorithms compactly. Functional programming has notable advantages for parallelization and automated verification of algorithms, and the most useful functional programming concepts are increasingly often introduced to standard programming languages. Because of the focus of functional programming on symbols, rather than numbers, functional programming has been heavily used in artificial intelligence fields, such as agent systems or symbolic machine learning.

BE4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6
BE4B38PSIA	Computer Networks Subject is devoted to principles and technologies of Computer Networks. Physical layer media, analog and digital modulations, network topologies, MAC methods, ARQ algorithms, data communication models, coding and cryptography basics are introduced. Widely used LAN technologies are then presented together with their features. Internet protocols are explained and internetworking approaches are presented.	Z,ZK	5
BE4B39VGO	Creating graphic content The aim of this course is to give to students an overview of methods to create 2D and 3D graphics content and how to apply those methods in praxis. Students will learn how to design and create three-dimensional scene, create and apply textures imitating materials (e.g., wall finishes, wood, sky) and geometrical details, and position and set-up lights in the scene. Student will also learn the terminology used in computer graphics.	Z,ZK	6
BE5B32PKS	Computer and Communication Networks The aim of the course is to familiarize students with current trends in the switched local networks and the key functions of routing protocols in IP networks. The course is aimed rather primarily practically than theoretically.	Z,ZK	6
BE5B33RPZ	Pattern Recognition and Machine Learning 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.	Z,ZK	6
BE5B35APO	Computer Architectures Subject provides overview of basic building blocks of computer systems. Explanation starts from hardware side where it extends knowledge presented in the previous lectures of Structures of computer systems. Topics cover building blocks description, CPU structure, multiple processors interconnections, input/output subsystem and basic overview of network and buses topologies. Emphasis is placed on clarification of interconnection of hardware components with software support, mainly lower levels of operating systems, device drivers and virtualization techniques. General principles are more elaborated during presentation of examples of multiple standard CPU architectures. Exercises are more focused on the software view to the contrary. Students are lead from basic programming on CPU level to the interaction with raw hardware.	Z,ZK	6
BE5B35LSP	Logic Systems and Processors The course is an introduction to basic hardware structures of computing resources, their design, and architecture. It provides an overview of the implementation of data operations at hardware and the creation of embedded processor systems with peripherals on advance programmable logic FPGAs.	Z,ZK	6
BEZB	Safety in Electrical Engineering for a bachelor's degree 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.	Z	0
BEZZ	Basic health and occupational safety regulations 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.	Z	0
TV-V1	Physical education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0

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

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