Study plan

Name of study plan: Open Informatics - Computer Games and Graphics 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 Čmejla Roman Čmejla (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

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** *Ivana Nová, Radek Havlíček, Vladimír Kůla* ***Radek Havlíček*** *Vladimír Kůla (Gar.)*	Z	0	2BP+2BC	Z,L	P
BEZZ	**Basic Health and Occupational Safety Regulations** *Ivana Nová, Radek Havlíček, Vladimír Kůla* ***Radek Havlíček*** *Vladimír Kůla (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	Z	0
The purpose of the safety course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it. This introductory course contains fundamentals of Safety Electrical Engineering. In this way the students receive qualification of instructed person that enables them to work on electrical equipment.			
BEZZ	Basic Health and Occupational Safety Regulations	Z	0
The guidelines were worked out based on The Training Scheme for Health and Occupational Safety designed for employees and students of the Czech Technical University in Prague, which was provided by the Rector´s Office of the CTU. Safety is considered one of the basic duties of all employees and students. The knowledge of Health and Occupational Safety regulations forms an integral and permanent part of qualification requirements. This program is obligatory.			

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-Berezovskyj, Daniel Průša* ***Daniel Průša*** *Marko Genyk-Berezovskyj (Gar.)*	Z,ZK	6	2P+2C	Z	P
B0B35APO	**Computer Architectures** *Pavel Píša, Richard Šusta, Petr Štěpán* ***Pavel Píša*** *Pavel Píša (Gar.)*	Z,ZK	5	2P+2L	L	P
B0B36DBS	**Database Systems** *Martin Řimnáč, Václav Kratochvíl* ***Martin Řimnáč*** *Martin Řimnáč (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** *Jiří Velebil, Jakub Rondoš, Natalie Žukovec, Daniel Gromada, Josef Dvořák, Matěj Dostál* ***Jiří Velebil*** *Jiří Velebil (Gar.)*	Z,ZK	8	4P+2S	Z	P
B0B01LGR	**Logic and Graphs** *Natalie Žukovec, Matěj Dostál, Alena Gollová* ***Alena Gollová*** *Marie Demlová (Gar.)*	Z,ZK	5	3P+2S	Z,L	P
B0B01MA1	**Mathematical Analysis 1** *Josef Dvořák, Martin Křepela, Josef Tkadlec, Veronika Sobotíková* ***Josef Tkadlec*** *Josef Tkadlec (Gar.)*	Z,ZK	7	4P+2S	Z,L	P
B0B01MA2	**Mathematical Analysis 2** *Miroslav Korbelář, Petr Hájek, Martin Bohata, Jaroslav Tišer, Karel Pospíšil, Paola Vivi, Hana Turčinová* ***Petr Hájek*** *Jaroslav Tišer (Gar.)*	Z,ZK	7	4P+2S	L,Z	P
B4B35OSY	**Operating Systems** *Petr Štěpán, Michal Sojka* ***Michal Sojka*** *Michal Sojka (Gar.)*	Z,ZK	4	2P+2C	Z	P
B0B33OPT	**Optimization** *Tomáš Werner, Petr Olšák, Mirko Navara, Tomáš Kroupa* ***Tomáš Werner*** *Tomáš Werner (Gar.)*	Z,ZK	7	4P+2C	Z,L	P
B4B36PDV	**Parallel and Distributed Computing** *Matěj Kafka, Michal Jakob* ***Michal Jakob*** *Michal Jakob (Gar.)*	Z,ZK	6	2P+2C	L	P
B4B38PSIA	**Computer Networks** *Jiří Novák, Jan Holub* ***Jiří Novák*** *Jiří Novák (Gar.)*	Z,ZK	5	2P+2L	L	P
B0B01PST	**Probability and Statistics** *Kateřina Helisová* ***Kateřina Helisová*** *Petr Hájek (Gar.)*	Z,ZK	7	4P+2S	Z	P
B0B36PRP	**Procedural Programming** *Jan Faigl* ***Jan Faigl*** *Jan Faigl (Gar.)*	Z,ZK	6	2P+2C	Z	P
B0B36PJV	**Programming in Java** *Jiří Vokřínek, Martin Mudroch, Ladislav Serédi* ***Jiří Vokřínek*** *Jiří Vokřínek (Gar.)*	Z,ZK	6	2P+3C+7D	L	P
B4B33RPH	**Solving Problems and other Games** *Tomáš Svoboda, Petr Pošík* ***Petr Pošík*** *Tomáš Svoboda (Gar.)*	KZ	6	2P+3C	Z	P
B4BPROJ6	**Unassisted project** *Tomáš Svoboda, Petr Pošík, Jiří Šebek, Jaroslav Sloup, Ivan Jelínek, Katarína Žmolíková* ***Petr Pošík***	Z	6	0+2	Z,L	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 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.			
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.			
B0B33OPT	Optimization	Z,ZK	7
The course provides an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated with a number of examples. You will refresh and extend many topics that you know from linear algebra and calculus courses.			
B4B36PDV	Parallel and Distributed Computing	Z,ZK	6
B4B38PSIA	Computer Networks	Z,ZK	5
B0B01PST	Probability and Statistics	Z,ZK	7
B0B36PRP	Procedural Programming	Z,ZK	6
The course accompanies basic programming emphasizing the data representation in computer memory. Furthermore, the concepts of linked data structures and processing user inputs are developed. Students master the practical implementation of simple individual tasks. The course emphasizes acquiring programming habits for creating readable and reusable programs. At the same time, the effort is to build students an overview of the program operation, data model, memory access, and management. Therefore, the C programming language is used that provides a direct link between the program data structures and their representation in the computer memory. Students will get acquainted not only with program compilation and linking but also with debugging and profiling. Labs aim to acquire practical skills of implementing simple individual tasks, emphasizing functionality and accuracy of implementation. Student independence is developed by a set of homework with the possibility of optional and bonus assignments. The final task is an integration of a larger program using existing implementations. Evaluation of coding style motivated by writing legible, understandable, and maintainable codes is also a part of the selected tasks.			
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.			
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.			
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** *Markéta Havlíčková, Pavla Péterová, Erik Peter Stadnik, Michael Ynsua, Dana Saláková, Petra Juna Jennings* ***Petra Juna Jennings*** *Petra Juna Jennings (Gar.)*	KZ	0	0C	Z,L	P
B0B04B2Z	**English language B2 - exam** *Markéta Havlíčková, Michael Ynsua, Dana Saláková, Petra Juna Jennings* ***Petra Juna Jennings*** *Petra Juna Jennings (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	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: Povinné předměty zaměření
Minimal number of credits of the block: 30

The role of the block: PZ

Code of the group: 2018_BOIPS4
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 - počítačové hry a grafika

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
B4B39IUR	**User interfaces implementation** *Zdeněk Míkovec, Miroslav Macík **Miroslav Macík** Zdeněk Míkovec (Gar.)*	Z,ZK	6	2P+2S	Z	PZ
B4B39HRY	**Computer Games** *Jiří Bittner, David Sedláček **David Sedláček** Jiří Bittner (Gar.)*	Z,ZK	6	2P+2C	Z	PZ
B0B39PGR	**Computer graphics programming** *Jaroslav Sloup, Petr Felkel **Jaroslav Sloup** Petr Felkel (Gar.)*	Z,ZK	6	2P+2C+8D	L	PZ
BE4B39VGO	**Creating graphic content** *Ladislav Čmolík **Ladislav Čmolík** Ladislav Čmolík (Gar.)*	Z,ZK	6	2P+2C+8D	Z	PZ
B4B36ZUI	**Introduction to Artificial Intelligence** *Viliam Lisý, Branislav Bošanský **Branislav Bošanský** Michal Pěchouček (Gar.)*	Z,ZK	6	2P+2C	L	PZ

Characteristics of the courses of this group of Study Plan: Code=2018_BOIPS4 Name=Compulsory subjects of the branch

B4B39IUR	User interfaces implementation	Z,ZK	6
Based on the user interface specification (created by design team), the student will be able to implement user interface and communicate efficiently with other stakeholders taking part in the whole process of design, testing, and implementation of the user interface.			
B4B39HRY	Computer Games	Z,ZK	6
Students familiarize themselves with the issues encountered during programming computer games. They learn topics such as 3D model representation, animations, collision detection, physical simulation, and real-time rendering in the context of computer games development. During exercises they will develop a computer game in teams: from the game concept and design document, through programming game mechanics to the presentation in front of a jury of experts. The exercises are build around the Unity framework.			
B0B39PGR	Computer graphics programming	Z,ZK	6
BE4B39VGO	Creating graphic content	Z,ZK	6
The aim of this course is to provide theory behind geometric modeling and modeling of materials, give students an overview of methods used in the process of creating 2D and 3D graphics and how to apply those methods in praxis. At the seminars, 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.			
B4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6
The aim of the course is to cover the basics of symbolic artificial intelligence. We will focus on algorithms of informed and uninformed state space search, problem representation and solving, representation of knowledge using formal logic, methods of automated reasoning, and an introduction to Markov decision making, and to two-player games. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			

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 vam 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)* *Tutors, **authors** and guarantors (gar.)*	Completion	Credits	Scope	Semester	Role
BE4B33SEA	**Subject in english - abroad** *Petr Pošík **Petr Pošík** Petr Pošík (Gar.)*	Z,ZK	0		Z,L	PV

BE5B32PKS	**Computer and Communication Networks** *Pavel Bezpalec* ***Pavel Bezpalec***	Z,ZK	6	2P + 2C	Z	PV
BE5B35APO	**Computer Architectures** *Pavel Píša, Richard Šusta* ***Pavel Píša*** *Pavel Píša (Gar.)*	Z,ZK	6	2P+2L	L	PV
BE4B38PSIA	**Computer Networks** *Jiří Novák, Jan Holub* ***Jiří Novák*** *Jiří Novák (Gar.)*	Z,ZK	5	2P+2L	L	PV
BE4B36FUP	**Functional Programming** *Rostislav Horčík, Tomáš Votroubek* ***Rostislav Horčík*** *Michal Pěchouček (Gar.)*	Z,ZK	6	2P+2C	L	PV
BE4B36ZUI	**Introduction to Artificial Intelligence** *Viliam Lisý, Branislav Bošanský* ***Branislav Bošanský*** *Branislav Bošanský (Gar.)*	Z,ZK	6	2P+2C	L	PV
BE5B35LSP	**Logic Systems and Processors** *Richard Šusta, Martin Hlinovský* ***Martin Hlinovský*** *Richard Šusta (Gar.)*	Z,ZK	6	3P+2L	Z	PV
BE5B33RPZ	**Pattern Recognition and Machine Learning** *Ondřej Drbohlav, Jiří Matas, Jan Šochman* ***Jan Šochman*** *Jiří Matas (Gar.)*	Z,ZK	6	2P+2C	Z	PV
BE4B39VGO	**Creating graphic content** *Ladislav Čmolík* ***Ladislav Čmolík*** *Ladislav Čmolík (Gar.)*	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

BE4B39VGO	Creating graphic content	Z,ZK	6

The aim of this course is to provide theory behind geometric modeling and modeling of materials, give students an overview of methods used in the process of creating 2D and 3D graphics and how to apply those methods in praxis. At the seminars, 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.

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.

BE5B32PKS	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 course is aimed rather primarily practically then theoretically.

BE5B35APO	Computer Architectures	Z,ZK	6

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.

BE4B38PSIA	Computer Networks	Z,ZK	5

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.

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 in artificial intelligence fields, such as agent systems or symbolic machine learning. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.

BE4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6

The aim of the course is to cover the basics of symbolic artificial intelligence. We will focus on algorithms of informed and uninformed state space search, problem representation and solving, representation of knowledge using formal logic, methods of automated reasoning, and an introduction to Markov decision making, and to two-player games. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.

BE5B35LSP	Logic Systems and Processors	Z,ZK	6

The course introduces the basic hardware structures of computing resources, their design, and architecture. It provides an overview of the possibilities of performing data operations at the hardware level and the design of embedded processor systems with peripherals on modern FPGA programmable logic circuits, which are increasingly widely used today. Students will learn their description in VHDL, from logic to more complex sequential circuits to practical finite state machine (FSM) designs. They will also master the correct design procedure using circuit simulation. Practical problems are solved using development boards used at hundreds of leading universities around the world. The course ends with RISC-V processor structure, cache, and pipeline processing.

BE5B33RPZ	Pattern Recognition and Machine Learning	Z,ZK	6

The basic formulations of the statistical decision problem are presented. The necessary knowledge about the (statistical) relationship between observations and classes of objects is acquired by learning on the raining set. The course covers both well-established and advanced classifier learning methods, as Perceptron, AdaBoost, Support Vector Machines, and Neural Nets. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.

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 Slámečka* ***Vladimír Slámečka*** *Vladimír Slámečka (Gar.)*	KZ	4	2P+2C	Z	v
B0B16FIL	**Philosophy** *Peter Zamarovský* ***Peter Zamarovský*** *Peter Zamarovský (Gar.)*	ZK	2	2P+0S	Z,L	v
B0B16FI1	**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 Josefovičová* ***Milena Josefovičová*** *Milena Josefovičová (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.			
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.			
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 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=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 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.			
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:

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: 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
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 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
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 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.			
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.			
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/			
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 an introduction to mathematical optimization, specifically to optimization in real vector spaces of finite dimension. The theory is illustrated with a number of examples. You will refresh and extend many topics that you know from linear algebra and calculus courses.			
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.			
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
The course accompanies basic programming emphasizing the data representation in computer memory. Furthermore, the concepts of linked data structures and processing user inputs are developed. Students master the practical implementation of simple individual tasks. The course emphasizes acquiring programming habits for creating readable and reusable programs. At the same time, the effort is to build students an overview of the program operation, data model, memory access, and management. Therefore, the C programming language is used that provides a direct link between the program data structures and their representation in the computer memory. Students will get acquainted not only with program compilation and linking but also with debugging and profiling. Labs aim to acquire practical skills of implementing simple individual tasks, emphasizing functionality and accuracy of implementation. Student independence is developed by a set of homework with the possibility of optional and bonus assignments. The final task is an integration of a larger program using existing implementations. Evaluation of coding style motivated by writing legible, understandable, and maintainable codes is also a part of the selected tasks.			
B0B39PGR	Computer graphics programming	Z,ZK	6
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.			
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.			
B4B36PDV	Parallel and Distributed Computing	Z,ZK	6
B4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6
The aim of the course is to cover the basics of symbolic artificial intelligence. We will focus on algorithms of informed and uninformed state space search, problem representation and solving, representation of knowledge using formal logic, methods of automated reasoning, and an introduction to Markov decision making, and to two-player games. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			
B4B38PSIA	Computer Networks	Z,ZK	5
B4B39HRY	Computer Games	Z,ZK	6
Students familiarize themselves with the issues encountered during programming computer games. They learn topics such as 3D model representation, animations, collision detection, physical simulation, and real-time rendering in the context of computer games development. During exercises they will develop a computer game in teams: from the game concept and design document, through programming game mechanics to the presentation in front of a jury of experts. The exercises are build around the Unity framework.			
B4B39IUR	User interfaces implementation	Z,ZK	6
Based on the user interface specification (created by design team), the student will be able to implement user interface and communicate efficiently with other stakeholders taking part in the whole process of design, testing, and implementation of the user interface.			
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 in artificial intelligence fields, such as agent systems or symbolic machine learning. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			
BE4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6
The aim of the course is to cover the basics of symbolic artificial intelligence. We will focus on algorithms of informed and uninformed state space search, problem representation and solving, representation of knowledge using formal logic, methods of automated reasoning, and an introduction to Markov decision making, and to two-player games. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			
BE4B38PSIA	Computer Networks	Z,ZK	5
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.			

BE4B39VGO	Creating graphic content	Z,ZK	6
The aim of this course is to provide theory behind geometric modeling and modeling of materials, give students an overview of methods used in the process of creating 2D and 3D graphics and how to apply those methods in praxis. At the seminars, 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.			
BE5B32PKS	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 course is aimed rather primarily practically then theoretically.			
BE5B33RPZ	Pattern Recognition and Machine Learning	Z,ZK	6
The basic formulations of the statistical decision problem are presented. The necessary knowledge about the (statistical) relationship between observations and classes of objects is acquired by learning on the raining set. The course covers both well-established and advanced classifier learning methods, as Perceptron, AdaBoost, Support Vector Machines, and Neural Nets. This course is also part of the inter-university programme prg.ai Minor. It pools the best of AI education in Prague to provide students with a deeper and broader insight into the field of artificial intelligence. More information is available at https://prg.ai/minor.			
BE5B35APO	Computer Architectures	Z,ZK	6
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.			
BE5B35LSP	Logic Systems and Processors	Z,ZK	6
The course introduces the basic hardware structures of computing resources, their design, and architecture. It provides an overview of the possibilities of performing data operations at the hardware level and the design of embedded processor systems with peripherals on modern FPGA programmable logic circuits, which are increasingly widely used today. Students will learn their description in VHDL, from logic to more complex sequential circuits to practical finite state machine (FSM) designs. They will also master the correct design procedure using circuit simulation. Practical problems are solved using development boards used at hundreds of leading universities around the world. The course ends with RISC-V processor structure, cache, and pipeline processing.			
BEZB	Safety in Electrical Engineering for a Bachelor´s Degree	Z	0
The purpose of the safety course is to give the students basic knowledge of electrical equipment and installation as to avoid danger arising from operation of it. This introductory course contains fundamentals of Safety Electrical Engineering. In this way the students receive qualification of instructed person that enables them to work on electrical equipment.			
BEZZ	Basic Health and Occupational Safety Regulations	Z	0
The guidelines were worked out based on The Training Scheme for Health and Occupational Safety designed for employees and students of the Czech Technical University in Prague, which was provided by the Rector´s Office of the CTU. Safety is considered one of the basic duties of all employees and students. The knowledge of Health and Occupational Safety regulations forms an integral and permanent part of qualification requirements. This program is obligatory.			
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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