

# Study plan

## Name of study plan: Open Informatics

Faculty/Institute/Others: Faculty of Electrical Engineering

Department:

Branch of study guaranteed by the department: Common courses

Garantor of the study branch:

Program of study: 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: 2015\_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:

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	<b>Subject in english - abroad</b>	Z,ZK	0		Z,L	P
BE5B35APO	<b>Computer Architectures</b> Pavel Piša, Richard Šusta <b>Pavel Piša</b> Pavel Piša (Gar.)	Z,ZK	6	2P+2L	L	P
BE4B38PSIA	<b>Computer Networks</b> Jiří Novák, Jan Holub <b>Jiří Novák</b> Jiří Novák (Gar.)	Z,ZK	5	2P+2L	L	P
BE5B32PKS	<b>Computer and Communication Networks</b> Leoš Boháč, Tomáš Vaněk, Pavel Bezpalec <b>Zbyněk Kocur</b> Leoš Boháč (Gar.)	Z,ZK	6	2P + 2C	Z	P
BE4B36FUP	<b>Functional Programming</b> Rostislav Horčík, Viliam Lisý, Michal Pěchouček <b>Viliam Lisý</b> Michal Pěchouček (Gar.)	Z,ZK	6	2P+2C	L	P
BE4B36ZUI	<b>Introduction to Artificial Intelligence</b> <b>Michal Pěchouček</b>	Z,ZK	6	2P+2C	L	P
BE5B35LSP	<b>Logic Systems and Processors</b> Richard Šusta <b>Richard Šusta</b> Richard Šusta (Gar.)	Z,ZK	6	3P+2L	Z	P
BE5B33RPZ	<b>Pattern Recognition and Machine Learning</b> Ondřej Drbohlav, Jiří Matas <b>Jiří Matas</b> Jiří Matas (Gar.)	Z,ZK	6	2P+2C	Z	P
BE4B35PSR	<b>Real-time Systems Programming</b> <b>Michal Sojka</b>	Z,ZK	6	2P+2C	Z	P
BE4B39VGO	<b>Creating graphic content</b> Ladislav Čmolík <b>Ladislav Čmolík</b> Ladislav Čmolík (Gar.)	Z,ZK	6	2P+2C	Z	P

### Characteristics of the courses of this group of Study Plan: Code=2015\_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
BE5B35APO	<b>Computer Architectures</b> 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	<b>Computer Networks</b> 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

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 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			
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
BE5B35LSP	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.			
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.			
BE4B35PSR	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.			
BE4B39VGO	Creating graphic content	Z,ZK	6
The aim of this course is to give to students 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.			

Code of the group: 2015\_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	Z	20	0+12	L,Z	P

Characteristics of the courses of this group of Study Plan: Code=2015\_BOIBAP Name=Bachelor Project

BBAP20	Bachelor thesis	Z	20
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Code of the group: 2015\_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 Kůla, Ivana Nová, Radek Havlíček Vladimír Kůla Vladimír Kůla (Gar.)	Z	0	2BP+2BC	Z,L	P
BEZZ	Basic health and occupational safety regulations Vladimír Kůla, Ivana Nová, Radek Havlíček Vladimír Kůla Vladimír Kůla (Gar.)	Z	0	2BP+2BC	Z	P

Characteristics of the courses of this group of Study Plan: Code=2015\_BOIBBE Name=Safety of the bachelor's studies

BEZB	Safety in Electrical Engineering for a bachelor's degree	Z	0
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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
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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: 2015\_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	<b>Ethic 1</b> Vladimír Slámečka <b>Vladimír Slámečka</b> Vladimír Slámečka (Gar.)	KZ	4	2P+2C	Z	P
B0B16FIL	<b>Philosophy</b> Peter Zamarovský <b>Peter Zamarovský</b> (Gar.)	ZK	2	2P+0S	Z,L	P
B0B16FI1	<b>Philosophy 1</b> Peter Zamarovský <b>Peter Zamarovský</b> Peter Zamarovský (Gar.)	KZ	4	2P+2S	Z	P
B0B16HI1	<b>History 1</b> Roman Elner, Milena Josefovičová <b>Milena Josefovičová</b> Milena Josefovičová (Gar.)	KZ	4	2P+2S	Z	P
B0B16HTE	<b>History of technology and economic</b> Marcela Efmertová, Jan Mikeš <b>Marcela Efmertová</b> Marcela Efmertová (Gar.)	ZK	2	2P+0S	Z,L	P
B0B16HT1	<b>History of science and technology 1</b> Marcela Efmertová, Jan Mikeš <b>Jan Mikeš</b> Marcela Efmertová (Gar.)	KZ	4	2P+2S	Z	P
B0B16MPS	<b>Psychology</b> Jan Fiala <b>Jan Fiala</b> Jan Fiala (Gar.)	Z,ZK	4	2P+2S	Z,L	P
B0B16MPL	<b>Psychology for managers</b> Jan Fiala <b>Jan Fiala</b> Jan Fiala (Gar.)	ZK	2	2P+0S	Z,L	P
A003TV	<b>Physical Education</b>	Z	2	0+2	L,Z	P

**Characteristics of the courses of this group of Study Plan: Code=2015\_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.			
B0B16HI1	History 1	KZ	4
B0B16HTE	History of technology and economic	ZK	2
B0B16HT1	History of science and technology 1	KZ	4
B0B16MPS	Psychology	Z,ZK	4
B0B16MPL	Psychology for managers	ZK	2
A003TV	Physical Education	Z	2

Code of the group: 2015\_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	<b>Algorithms</b> Marko Genyk-Berezovskij, Daniel Průša <b>Daniel Průša</b> Marko Genyk-Berezovskij (Gar.)	Z,ZK	6	2P+2C	Z	P
B0B35APO	<b>Computer Architectures</b> Pavel Piša, Richard Šusta, Petr Štěpán <b>Pavel Piša</b> Pavel Piša (Gar.)	Z,ZK	5	2P+2L	L	P

B0B36DBS	<b>Database Systems</b> <i>Martin Svoboda</i>	Z,ZK	6	2P+2C	L	P
B4B01DMA	<b>Discrete Mathematics</b> <i>Petr Habala Petr Habala Petr Habala (Gar.)</i>	Z,ZK	5	2P+2S	Z	P
B0B01LAG	<b>Linear Algebra</b> <i>Jiří Velebil, Paola Vivi, Kateřina Helisová, Matěj Dostál Jiří Velebil (Gar.)</i>	Z,ZK	8	4P+2S	Z	P
B0B01LGR	<b>Logic and Graphs</b> <i>Matěj Dostál, Alena Gollová, Anna Kalousová Matěj Dostál Marie Demlová (Gar.)</i>	Z,ZK	5	3P+2S	Z,L	P
B0B01MA1	<b>Mathematical Analysis 1</b> <i>Karel Pospíšil, Anna Kalousová, Josef Tkadlec, Veronika Sobotíková, Josef Hekrdla Veronika Sobotíková Josef Tkadlec (Gar.)</i>	Z,ZK	7	4P+2S	Z,L	P
B0B01MA2	<b>Mathematical Analysis 2</b> <i>Paola Vivi, Josef Hekrdla, Petr Hájek, Jaroslav Tišer, Miroslav Korbelař, Natalie Žukovec, Matěj Novotný Petr Hájek Jaroslav Tišer (Gar.)</i>	Z,ZK	7	4P+2S	L,Z	P
B4B35OSY	<b>Operating Systems</b> <i>Petr Štěpán, Michal Sojka Michal Sojka Michal Sojka (Gar.)</i>	Z,ZK	4	2P+2C	Z	P
B0B33OPT	<b>Optimization</b> <i>Tomáš Kroupa, Tomáš Werner, Petr Olšák Tomáš Kroupa Tomáš Werner (Gar.)</i>	Z,ZK	7	4P+2C	Z,L	P
B4B36PDV	<b>Parallel and Distributed Computing</b> <i>Branislav Bošanský, Michal Jakob Michal Jakob</i>	Z,ZK	6	2P+2C	L	P
B4B38PSIA	<b>Computer Networks</b> <i>Jiří Novák, Jan Holub Jiří Novák Jiří Novák (Gar.)</i>	Z,ZK	5	2P+2L	L	P
B0B01PST	<b>Probability and Statistics</b> <i>Petr Hájek, Miroslav Korbelař, Matěj Novotný, Mirko Navara, Milan Petrik Petr Hájek Mirko Navara (Gar.)</i>	Z,ZK	7	4P+2S	Z,L	P
B0B36PRP	<b>Procedural Programming</b> <i>Jan Faigl Jan Faigl Jan Faigl (Gar.)</i>	Z,ZK	6	2P+2C	Z	P
B0B36PJV	<b>Programming in Java</b> <i>Jiří Vokřínek Jiří Vokřínek Jiří Vokřínek (Gar.)</i>	Z,ZK	6	2P+3C	L	P
B4BPROJ6	<b>Unassisted project</b> <i>Jiří Šebek, Jaroslav Sloup, Ivan Jelínek, Katarína Ťakušová, Tomáš Svoboda, Petr Pošík Jaroslav Sloup</i>	Z	6	0+2		P
B4B33RPH	<b>Solving Problems and other Games</b> <i>Tomáš Svoboda, Petr Pošík Tomáš Svoboda Tomáš Svoboda (Gar.)</i>	KZ	6	2P+3C	Z	P

#### Characteristics of the courses of this group of Study Plan: Code=2015\_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
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, induction, cardinality of sets, 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
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.			
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 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.			
B4B36PDV	Parallel and Distributed Computing	Z,ZK	6
B4B38PSIA	Computer Networks	Z,ZK	5
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.			
B0B36PRP	Procedural Programming	Z,ZK	6
B0B36PJV	Programming in Java	Z,ZK	6
B4BPROJ6	Unassisted project	Z	6

B4B33RPH	Solving Problems and other Games	KZ	6
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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.

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	<b>English language B1 - classified assessment</b> Dana Saláková, Markéta Havlíčková, Pavla Péterová, Dana Saláková (Gar.)	KZ	0	0C	Z,L	P
B0B04B2Z	<b>English language B2 - exam</b> Dana Saláková, Markéta Havlíčková, Pavla Péterová, Petra Jennings, Michael Ynsua, Pavla Péterová, 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 B2 Common European Framework: 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. Grammar and Vocabulary: word families, verb-noun collocations, complex noun phrases, countable and uncountable nouns, prefixes, it-clauses, reporting verbs, questions, modal verbs, conjunctions and sentence connectors, articles, prepositions, wh-noun clauses, relative clauses, if-clauses, passive voice, past perfect, -ing nouns Listening: picking up information, transferring information Reading: A technical text is presented. Students are required to show understanding the concept and vocabularies. Writing: Emphasis is put on the expression of ideas in the independent writing of paragraphs and short essays. Students should be able to present a short basic argument in written English. Oral Skills: Students are supposed to use the language independently and effectively in all situations giving their own opinions and defending their ideas and beliefs. A mixture of research and development, career oriented and general topics is presented. Examination: The examination consists of two parts: a) Written test ? based on grammar and lexicology, NOT TAKEN by the students whose success rate in both the summer semester tests (Midterm and Final) is above 80%. The written test is followed by the oral part. b) Oral part ? reading a technical text with understanding (study reading techniques ? skimming and scanning, comprehension and discussion questions based on the text, translation), oral interaction, comprehending the content of the spoken message.	Z,ZK	0

Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 30

The role of the block: PO

Code of the group: 2015\_BOIPO1

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:

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
B4B36FUP	<b>Functional Programming</b> Rostislav Horčík, Viliam Lisý, Viliam Lisý, Michal Pěchouček (Gar.)	Z,ZK	6	2P+2C	L	PO
B4B01JAG	<b>Languages, Automats and Gramatics</b> Marie Demlová, Jiří Demel, Marie Demlová, Marie Demlová (Gar.)	Z,ZK	6	2P+2S	Z	PO
B4B01NUM	<b>Numerical Analysis</b> Mirko Navara, Aleš Němeček, Aleš Němeček, Mirko Navara (Gar.)	Z,ZK	6	2P+2C	Z	PO
B4B33RPZ	<b>Recognition and machine learning</b> Ondřej Drbohlav, Jiří Matas, Ondřej Drbohlav, Jiří Matas (Gar.)	Z,ZK	6	2P+2C	Z	PO
B4B36ZUI	<b>Introduction to Artificial Intelligence</b> Michal Pěchouček, Jiří Kléma, Tomáš Krajník, Michal Pěchouček, Michal Pěchouček (Gar.)	Z,ZK	6	2P+2C	L	PO

Characteristics of the courses of this group of Study Plan: Code=2015\_BOIPO1 Name=Compulsory subjects of the branch

B4B36FUP	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.			
B4B01JAG	Languages, Automats and Gramatics	Z,ZK	6
Basic notions of the theory of finite automata and grammars: deterministic and non deterministic finite automata, languages accepted by finite automata, regular expressions. Grammars and languages generated by grammars with emphasis to context free grammars. A very brief introduction of Turing machines.			
B4B01NUM	Numerical Analysis	Z,ZK	6
The course introduces to basic numerical methods of interpolation and approximation of functions, numerical differentiation and integration, solution of transcendent equations and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demonstration of their properties using Maple and computer graphics.			
B4B33RPZ	Recognition and machine learning	Z,ZK	6
The basic formulations of the statistical decision problem are presented. The necessary knowledge about the (statistical) relationship between observations and classes of objects is acquired by learning on the raining set. The course covers both well-established and advanced classifier learning methods, as Perceptron, AdaBoost, Support Vector Machines, and Neural Nets.			
B4B36ZUI	Introduction to Artificial Intelligence	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: 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) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
B0B04A21	<b>English Language A2-1</b> <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z		2s	Z	v
B0B04A22	<b>English Language A2-2</b> <i>Markéta Havlíčková</i>	Z	0	2s	L	v
B0B04B11	<b>English Language B1-1</b> <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	0	2s	Z	v
B0B04B12	<b>English Language B1-2</b> <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	0	2C	L	v
B0B04B21	<b>English Language B2-1</b> <i>Pavla Péterová Dana Saláková (Gar.)</i>	Z	3	2C	Z	v
B0B04B22	<b>English Language B2-2</b> <i>Pavla Péterová Dana Saláková (Gar.)</i>	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
The course is suitable for students who have good knowledge of the material covered in secondary school in that language. Course objective: The course focuses on technical English and practising difficult grammar concepts.			
B0B04B22	English Language B2-2	Z	3
The course is suitable for students who have good knowledge of the material covered in secondary school. Course objective: The course focuses on technical English and practising difficult grammar.			

Code of the group: BTV

Name of the group: Tělesná výchova

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

Characteristics of the courses of this group of Study Plan: Code=BTV Name=Tělesná výchova

A003TV	Physical Education	Z	2
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
TV-V1	Physical education	Z	1

Code of the group: BTVK

Name of the group: Tělovýchovné kurzy

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=Tělovýchovné kurzy

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

Code of the group: 2015\_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
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

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 verifying of the student's skills of B1 level	KZ	0
B0B04B21	English Language B2-1	Z	3
The course is suitable for students who have good knowledge of the material covered in secondary school in that language. Course objective: The course focuses on technical English and practising difficult grammar concepts.			
B0B04B22	English Language B2-2	Z	3
The course is suitable for students who have good knowledge of the material covered in secondary school. Course objective: The course focuses on technical English and practising difficult grammar.			
B0B04B2Z	English language B2 - exam	Z,ZK	0
B2 Common European Framework: 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. Grammar and Vocabulary: word families, verb-noun collocations, complex noun phrases, countable and uncountable nouns, prefixes, it-clauses, reporting verbs, questions, modal verbs, conjunctions and sentence connectors, articles, prepositions, wh-noun clauses, relative clauses, if-clauses, passive voice, past perfect, -ing nouns Listening: picking up information, transferring information Reading: A technical text is presented. Students are required to show understanding the concept and vocabularies. Writing: Emphasis is put on the expression of ideas in the independent writing of paragraphs and short essays. Students should be able to present a short basic argument in written English. Oral Skills: Students are supposed to use the language independently and effectively in all situations giving their own opinions and defending their ideas and beliefs. A mixture of research and development, career oriented and general topics is presented. Examination: The examination consists of two parts: a) Written test ? based on grammar and lexicology, NOT TAKEN by the students whose success rate in both the summer semester tests (Midterm and Final) is above 80%. The written test is followed by the oral part. b) Oral part ? reading a technical text with understanding (study reading techniques ? skimming and scanning, comprehension and discussion questions based on the text, translation), oral interaction, comprehending the content of the spoken message.			
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
B0B36DBS	Database Systems	Z,ZK	6
B0B36PJV	Programming in Java	Z,ZK	6
B0B36PRP	Procedural Programming	Z,ZK	6
B4B01DMA	Discrete Mathenatics	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, induction, cardinality of sets, 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.			
B4B01JAG	Languages, Automats and Gramatics	Z,ZK	6
Basic notions of the theory of finite automata and grammars: deterministic and non deterministic finite automata, languages accepted by finite automata, regular expressions. Grammars and languages generated by grammars with emphasis to context free grammars. A very brief introduction of Turing machines.			
B4B01NUM	Numerical Analysis	Z,ZK	6
The course introduces to basic numerical methods of interpolation and approximation of functions, numerical differentiation and integration, solution of transcendent equations and systems of linear equations. Emphasis is put on estimation of errors, practical skills with the methods and demonstration of their properties using Maple and computer graphics.			
B4B33ALG	Algorithms	Z,ZK	6
In the course, the algorithms development is constructed with minimum dependency to programming language; nevertheless the lectures and seminars are based on Java. Basic data types a data structures, basic algorithms, recursive functions, abstract data types, stack, queues, trees, searching, sorting, special application algorithms, Dynamic programming. Students are able to design and construct non-trivial algorithms and to evaluate their effectivity.			



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.			
B4B33RPZ	Recognition and machine learning	Z,ZK	6
The basic formulations of the statistical decision problem are presented. The necessary knowledge about the (statistical) relationship between observations and classes of objects is acquired by learning on the raining set. The course covers both well-established and advanced classifier learning methods, as Perceptron, AdaBoost, Support Vector Machines, and Neural Nets.			
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.			
B4B36FUP	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.			
B4B36PDV	Parallel and Distributed Computing	Z,ZK	6
B4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6
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.			
BE4B35PSR	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.			
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.			
BE4B36ZUI	Introduction to Artificial Intelligence	Z,ZK	6
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 give to students 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.			
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 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			
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.			
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 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.			
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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