

## Study plan

### Name of study plan: Bc. Branch Security and Information Technology, in Czech, Version 2015, 2016, 2017 and 2018

Faculty/Institute/Others:

Department: Department of Computer Systems

Branch of study guaranteed by the department: Computer Security and Information technology

Garantor of the study branch: prof. Ing. Róbert Lórencz, CSc.

Program of study: Informatics (in Czech)

Type of study: Bachelor full-time

Required credits: 159

Elective courses credits: 21

Sum of credits in the plan: 180

Note on the plan: Tato verze studijního plánu je určena pro ročníky, které byl přijaty ke studiu od akademického roku 2015/16 do prezenční formy studia bakalářského programu

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 119

The role of the block: PP

Code of the group: BI-PP.2015

Name of the group: Compulsory Courses of Bachelor Study Program Informatics, Presented in Czech, Version 2015

Requirement credits in the group: In this group you have to gain 119 credits

Requirement courses in the group: In this group you have to complete at least 21 courses

Credits in the group: 119

Note on the group: Povinný předmět BI-SI1 se studentům bez oboru nezapisuje automaticky. Zapiší si jej individuálně podle pokynů z katedry Softwarového inženýrství.

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
BI-AG1	<b>Algorithms and Graphs 1</b> Pavel Tvrdlík, Tomáš Valla, Jiřina Scholtzová, Ondřej Suchý <b>Pavel Tvrdlík</b> Pavel Tvrdlík (Gar.)	Z,ZK	6	2P+2C	Z	PP
BI-AAG	<b>Automata and Grammars</b> Jan Holub, Jan Janoušek, Martin Svoboda, Radomír Polách, Ondřej Guth <b>Jan Janoušek</b> Jan Holub (Gar.)	Z,ZK	6	2P+2C	Z	PP
BI-BAP	<b>Bachelor Thesis</b> <b>Miroslav Balík</b> Miroslav Balík (Gar.)	Z	14		L,Z	PP
BI-BPR	<b>Bachelor project</b> <b>Miroslav Balík</b>	Z	2		Z,L	PP
BI-BEZ	<b>Security</b> Jiří Buček, Jiří Dostál, Martin Jelínek, Martin Jureček, Filip Kodýtek, Róbert Lórencz, Tomáš Zahradnický <b>Daniel Koblíček</b> Róbert Lórencz (Gar.)	Z,ZK	6	2P+1R+1C	L	PP
BI-CAO	<b>Digital and Analog Circuits</b> Jaroslav Borecký, Martin Daňhel, Martin Kohlík, Pavel Kubalík, Martin Novotný, Jan Kyncl <b>Martin Kohlík</b> Martin Novotný (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-DBS	<b>Database Systems</b> Tomáš Nováček, Jan Blizničenko, Filip Glazar, Jiří Hunka, Karel Quast, David Šenkýř, Michal Valenta, Cyril Černý, Oldřich Malec, ..... <b>Antonín Procházka</b> Michal Valenta (Gar.)	Z,ZK	6	2P+2R+1L	Z,L	PP
BI-DPR	<b>Document., Presentation, Rhetorics</b> Eliška Šestáková, Ondřej Guth, Miroslav Hrončok, Petra Pavličková, Dana Vyníkarová, Alena Libánská <b>Ondřej Guth</b> Dana Vyníkarová (Gar.)	KZ	4	2P+2C	Z,L	PP
BI-LIN	<b>Linear Algebra</b> Daniel Dombek, Luděk Kleprlík <b>Daniel Dombek</b> Daniel Dombek (Gar.)	Z,ZK	7	4P+2C	L	PP
BI-MLO	<b>Mathematical Logic</b> Jan Starý, Kateřina Trlifajová <b>Jan Starý</b> Kateřina Trlifajová (Gar.)	Z,ZK	5	2P+1C	Z	PP
BI-OSY	<b>Operating Systems</b> Ladislav Vagner, Jiří Kašpar, Michal Šoch, Michal Štepanovský, Jan Trdlička <b>Jiří Kašpar</b> Jan Trdlička (Gar.)	Z,ZK	5	2P+1R+1L	L	PP

BI-PSI	<b>Computer Networks</b> <i>Pavel Kubalík, Dana Čermáková, Viktor Černý, Vladimír Smotlacha, Yelena Trofimova, Ondřej Lauer, Vojtěch Pail Tomáš Herout Vladimír Smotlacha (Gar.)</i>	Z,ZK	5	2P+1R+1C	L	PP
BI-PST	<b>Probability and Statistics</b> <i>Pavel Hrabák, Petr Novák, Daniel Vašata Pavel Hrabák Petr Novák (Gar.)</i>	Z,ZK	5	2P+1R+1C	Z	PP
BI-PAI	<b>Law and Informatics</b> <i>Alžběta Krausová, Zdeněk Kučera, Matěj Myška, Michal Matějka Zdeněk Kučera (Gar.)</i>	ZK	3	2P	Z	PP
BI-PA1	<b>Programming and Algorithmics 1</b> <i>Miroslav Balík, Ladislav Vagner, Josef Vogel Ladislav Vagner Ladislav Vagner (Gar.)</i>	Z,ZK	6	2P+2R+2C	Z	PP
BI-PA2	<b>Programming and Algorithmics 2</b> <i>Jiří Chludil, Ladislav Vagner, Josef Vogel Ladislav Vagner Josef Vogel (Gar.)</i>	Z,ZK	7	2P+1R+2C	L	PP
BI-PS1	<b>Programming in Shell 1</b> <i>Lukáš Bařínka, Dana Čermáková, Viktor Černý, Jiří Kašpar, Zdeněk Muzikář, Michal Soch, Jan Trdlička Dana Čermáková Zdeněk Muzikář (Gar.)</i>	KZ	5	2P+2C	Z	PP
BI-SI1.2	<b>Software Engineering I</b> <i>Petr Kroha, Stanislav Kuznetsov, Jiří Mlejnek, Zdeněk Rybala, Marek Skotnica, Marek Suchánek Jiří Mlejnek Jiří Mlejnek (Gar.)</i>	Z,ZK	5	2P+1C	Z,L	PP
BI-SAP	<b>Computer Structure and Architecture</b> <i>Petr Fišer, Hana Kubátová, Martin Novotný Hana Kubátová Hana Kubátová (Gar.)</i>	Z,ZK	6	2P+1R+2C	L	PP
BI-ZDM	<b>Elements of Discrete Mathematics</b> <i>Jiřina Scholtzová, Josef Kolář, Petr Matyáš, Daniel Dombek Daniel Dombek Josef Kolář (Gar.)</i>	Z,ZK	5	2P+2C	Z	PP
BI-ZMA	<b>Elements of Calculus</b> <i>Jitka Hrabáková, Tomáš Kalvoda, Ivo Petr Jitka Hrabáková Tomáš Kalvoda (Gar.)</i>	Z,ZK	6	3P+2C	Z	PP

### Characteristics of the courses of this group of Study Plan: Code=BI-PP.2015 Name=Compulsory Courses of Bachelor Study Program Informatics, Presented in Czech, Version 2015

BI-AG1	Algorithms and Graphs 1	Z,ZK	6
The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It is interlinked with the concurrent BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of algorithms and learn to handle practically the asymptotic mathematics.			
BI-AAG	Automata and Grammars	Z,ZK	6
Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions and regular grammars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, Relationships between formal languages and automata. Knowledge acquired through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation, and design of digital circuits.			
BI-BAP	Bachelor Thesis	Z	14
BI-BPR	Bachelor project	Z	2
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-BEZ	Security	Z,ZK	6
Students understand the mathematical fundamentals of cryptography and have an overview of current cryptographic algorithms and applications: symmetric and asymmetric cryptosystems, and hash functions. They also learn the fundamentals of secure programming and IT security, the fundamentals of designing and using modern cryptosystems for computer systems. They are able to use properly and securely cryptographic primitives and systems that are based on these primitives.			
BI-CAO	Digital and Analog Circuits	Z,ZK	5
Students get the fundamental understanding of technologies underlying electronic digital systems. They understand the basic theoretical models and principles of functionality of transistors, gates, circuits, and conductors. They are able to design simple circuits and evaluate circuit parameters. They understand the differences between analog and digital modes of electronic devices.			
BI-DBS	Database Systems	Z,ZK	6
Students are introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to design small databases (including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the SQL language, as well as with its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundamental concepts of transaction processing, controlling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to special ways of storing data in relational databases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database systems, debugging and optimizing database applications, distributed database systems, data stores.			
BI-DPR	Document., Presentation, Rhetorics	KZ	4
This subject is aimed to the professional communication and writing of the scientific texts (bachelor's and diploma thesis). Students will learn to create and prepare interactive presentations and presenting before an audience. Students will also learn to write technical reports and scientific texts.			
BI-LIN	Linear Algebra	Z,ZK	7
The course is taught in Czech. Students understand the theoretical foundation of algebra and mathematical principles of linear models of systems around us, where the dependencies among components are only linear. They know the basic methods for operating with matrices and linear spaces. They are able to perform matrix operations and solve systems of linear equations. They can apply these mathematical principles to solving problems in 2D or 3D analytic geometry. They understand the error-detecting and error-correcting codes.			
BI-MLO	Mathematical Logic	Z,ZK	5
The course seminary is taught in Czech.			
BI-OSY	Operating Systems	Z,ZK	5
Students understand the classical theory of operating systems (OS) in addition to the knowledge gained in the BI-UOS module. They get a solid knowledge of OS kernels, processes and threads implementations. They understand the problems of race conditions and principles and algorithms for critical sections, thread scheduling, resource allocation, deadlocks. They understand the techniques of the management of virtual memory, principles and architectures of disks and disk arrays, file systems, and peripheral devices. They gain basic knowledge necessary for developing system applications or for system administration. They are able to design and implement simple multithreaded applications.			

BI-PSI	Computer Networks	Z,ZK	5
Students understand the basic common techniques, protocols, technologies, and algorithms necessary to communicate in computer networks. The topics are primarily focused on the 2nd to 4th layer of the ISO OSI model. They also get a basic understanding of communication media, security, and network administration. Students will be able to write a simple network application and configure a simple network.			
BI-PST	Probability and Statistics	Z,ZK	5
Students are introduced to elements of probability thinking, ability of the synthesis both prior and posterior information and use to work with random variables. They will be able to apply correctly basic models of the distribution of random variables and to solve applied probability problems in the area of informatics and computer science. Using statistical inference methods, they master methods of statistical inference to estimate unknown population parameters on the basis of sample. They get acquainted with basic methods of the determination of possible statistical dependence of two or more random variables.			
BI-PAI	Law and Informatics	ZK	3
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-PA1	Programming and Algorithmics 1	Z,ZK	6
Students gain the ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, structured, pointers), expressions, statements, functions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searching, sorting, and manipulating with linked lists.			
BI-PA2	Programming and Algorithmics 2	Z,ZK	7
Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, queue, enlargeable array, set, table). They can implement linked structures. They learn these skills using the programming language C++. Although this is not a module of programming in C++, students are introduced with all C++ features needed to achieve the main objective (operator overloading, templates).			
BI-PS1	Programming in Shell 1	KZ	5
Students become advanced and knowledgeable users of common UNIX-like operating systems. They understand the fundamental principles of the operating systems (file systems, processes and threads, access rights, memory management, network interfaces). They gain the knowledge of advanced users, with hands-on experience of the shell, basic commands, and filters to process various text data.			
BI-SI1.2	Software Engineering I	Z,ZK	5
Students learn the methods of analysis and design of large software systems, which are typically designed and implemented in teams. They get practical skill thanks to applying hands-on analysis and design of a large-scale software project that is to be developed within the concurrent BI-SP1 module. They get skill to use CASE tools and UML for modelling and solving software-related problems. They get overview of object-oriented analysis, design, architecture, validation, verification, and testing processes.			
BI-SAP	Computer Structure and Architecture	Z,ZK	6
Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputs, outputs, data storage and transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design tools. The subject teaches basic knowledge of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connections to higher programming languages.			
BI-ZDM	Elements of Discrete Mathematics	Z,ZK	5
Students get both a mathematical sound background, but also practical calculation skills in the area of combinatorics, value estimation and formula approximation, tools for solving recurrent equations, and basics of graph theory.			
BI-ZMA	Elements of Calculus	Z,ZK	6
Students acquire knowledge and understanding of the fundamentals of classical calculus so that they are able to apply mathematical way of thinking and reasoning and are able to use basic proof techniques. They get skills to practically handle functions of one variable in solving the problems in informatics. They understand the links between the integrals and sums of sequences. They are able to estimate lower or upper bounds of values of real functions and to handle simple asymptotic expressions.			

Name of the block: Compulsory courses of the specialization

Minimal number of credits of the block: 28

The role of the block: PO

Code of the group: BI-PO-BIT.2015

Name of the group: Compulsory Courses of Bc. Branch Security and Information Technology, in English, Version 2015

Requirement credits in the group: In this group you have to gain 28 credits

Requirement courses in the group: In this group you have to complete 6 courses

Credits in the group: 28

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
BI-ADU.1	<b>Unix Administration</b> Jan Žďárek, Zdeněk Muzikář <b>Zdeněk Muzikář</b> Zdeněk Muzikář (Gar.)	Z,ZK	5	2P+2C	L	PO
BI-ADW.1	<b>Windows Administration</b> Jiří Kašpar, Miroslav Prágl <b>Miroslav Prágl</b> Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	PO
BI-APS.1	<b>Architectures of Computer Systems</b> Pavel Tvrdík, Michal Štepanovský <b>Jiří Dostál</b> Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	PO
BI-BEK	<b>Secure Code</b> Josef Kokeš <b>Josef Kokeš</b> Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	PO
BI-HWB	<b>Hardware Security</b> Jiří Buček, Filip Kodýtek, Róbert Lórencz <b>Róbert Lórencz</b> Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	Z	PO
BI-SSB	<b>System and Network Security</b> Jiří Dostál <b>Alexandru Moucha</b> Jiří Dostál (Gar.)	Z,ZK	5	2P+2C	Z	PO

**Characteristics of the courses of this group of Study Plan: Code=BI-PO-BIT.2015 Name=Compulsory Courses of Bc. Branch Security and Information Technology, in English, Version 2015**

BI-ADU.1	Unix Administration	Z,ZK	5
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-ADW.1	Windows Administration	Z,ZK	4
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-APS.1	Architectures of Computer Systems	Z,ZK	5
Students understand architectures of uniprocessor computers at the level of machine instructions, with emphasis to instruction pipelining and memory hierarchy. They know the main concepts of RISC and CISC architectures. They learn how modern computers work and how they are constructed. They learn about the techniques that today's processors use to increase the program execution speed. They have a basic knowledge allowing them to optimise their programs to fully exploit a given processor architecture. They get an idea about the trends in the area of computer architectures and how they will affect software. They also understand the architectures of vector processors, their use in today's microprocessors. They understand the principles of shared-memory multiprocessor system architectures and the issues of memory consistency.			
BI-BEK	Secure Code	Z,ZK	5
The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them.			
BI-HWB	Hardware Security	Z,ZK	5
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-SSB	System and Network Security	Z,ZK	5
This course is presented in Czech.			

Name of the block: Povinné ekonomické

Minimal number of credits of the block: 4

The role of the block: PE

Code of the group: BI-PP-EM.2015

Name of the group: Compulsory Economics and Management Bachelor Courses, in Czech, Version 2015

Requirement credits in the group: In this group you have to gain 4 credits

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

Credits in the group: 4

Note on the group: Povinný předmět BI-EMP se studentům bez oboru nezapisuje automaticky. Zapiší si jej individuálně podle pokynů z katedry Softwarového inženýrství.

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
BI-EMP	<b>Economics and Management Principles</b> David Buchtela, Petra Pavlíčková, Pavla Vozárová David Buchtela David Buchtela (Gar.)	KZ	4	2P+2C	Z,L	PE

**Characteristics of the courses of this group of Study Plan: Code=BI-PP-EM.2015 Name=Compulsory Economics and Management Bachelor Courses, in Czech, Version 2015**

BI-EMP	Economics and Management Principles	KZ	4
This course is aimed to fundamental problems of business economy. The course makes students familiar with a life cycle of business, specifically with fields: enterprise foundation, enterprise putting into state economic environment (CR), management of property and capital structure, business transaction records keeping during an accounting period, a relation between business production and costs, evaluation of enterprise financial health and business rehabilitation or termination.			

Name of the block: Compulsory elective economic-management courses

Minimal number of credits of the block: 4

The role of the block: VE

Code of the group: BI-PV-EM.2015

Name of the group: Compulsory Elective Economical Courses of Bc. Program Informatics, Presented in Czech, Ver. 2015

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

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

Credits in the group: 4

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
BI-DAN	<b>Taxes for non-Economists</b> Lucie Kábelová, Savina Finardi Michal Valenta Savina Finardi (Gar.)	Z,ZK	4	2P+2C	Z	VE

BI-FTR.1	<b>Financial Markets</b> <i>Pavla Vozárová</i>	Z,ZK	5	2P+2C	L	VE
BI-MEK	<b>Macroeconomic Context of Domestic and World Economy</b> <i>Ivo Straka Michal Valenta Ivo Straka (Gar.)</i>	Z,ZK	4	2P+2C	Z	VE
BI-PRP	<b>Law and business</b> <i>Zdeněk Kučera Zdeněk Kučera (Gar.)</i>	Z,ZK	4	2P+1R	L	VE
BI-PRR	<b>Project management</b> <i>Martin Půlpitel Martin Půlpitel Martin Půlpitel (Gar.)</i>	KZ	4	2P+2C	Z	VE
BI-SEP	<b>World Economy and Business</b> <i>Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)</i>	Z,ZK	4	2P+2C	L	VE
BI-MIK	<b>Fundamentals of Microeconomics</b> <i>Pavla Vozárová Pavla Vozárová Pavla Vozárová (Gar.)</i>	Z,ZK	4	2P+2C	Z	VE

**Characteristics of the courses of this group of Study Plan: Code=BI-PV-EM.2015 Name=Compulsory Elective Economical Courses of Bc. Program Informatics, Presented in Czech, Ver. 2015**

BI-DAN	Taxes for non-Economists Taxes, including social insurance contributions, are obligatory payments paid by people or institutions to public budgets. This is the way how a significant portion of GDP is redistributed. This course concerns who pays which taxes or who bears the tax burden. The course introduces students to the tax theory and policy fundamentals and shows how they affect taxation of income, consumption, and wealth. The course provides practical information on calculations of tax liabilities of both citizens and institutions as well as information about important taxpayers' formal duties towards public administration.	Z,ZK	4
BI-FTR.1	Financial Markets This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	5
BI-MEK	Macroeconomic Context of Domestic and World Economy This course is presented in Czech.	Z,ZK	4
BI-PRP	Law and business This course is presented in Czech.	Z,ZK	4
BI-PRR	Project management This course is presented in Czech.	KZ	4
BI-SEP	World Economy and Business This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	Z,ZK	4
BI-MIK	Fundamentals of Microeconomics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4

Name of the block: Povinná zkouška z angličtiny

Minimal number of credits of the block: 2

The role of the block: PJ

Code of the group: BI-ZKA

Name of the group: English Language, Internal Certificate

Requirement credits in the group: In this group you have to gain 2 credits

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

Credits in the group: 2

Note on the group: Ze skupiny je nutné absolvovat jeden ze dvou předmětů, představujících interní zkoušku z angličtiny. Předmět BI-ANG si zapisují studenti, kteří absolvovali přípravné kurzy z angličtiny a mají zápočet z předmětu BI-A2L. Předmět BI--ANG1 si zapisují studenti, kteří se na zkoušku připravovali samostatně. Tito studenti musí před vlastní zkouškou absolvovat zápočtovou písemku.

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
BI-ANG1	<b>English Language Examination without Preparatory Courses</b> <i>Kateřina Valentová Kateřina Valentová Kateřina Valentová (Gar.)</i>	Z,ZK	2		L	PJ
BI-ANG	<b>English Language, Internal Certificate</b> <i>Kateřina Valentová Kateřina Valentová Kateřina Valentová (Gar.)</i>	ZK	2		L	PJ

**Characteristics of the courses of this group of Study Plan: Code=BI-ZKA Name=English Language, Internal Certificate**

BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-ANG	English Language, Internal Certificate	ZK	2

Name of the block: Povinná tělesná výchova, sportovní kurzy

Minimal number of credits of the block: 0

The role of the block: PT

Code of the group: BI-PT.2015

Name of the group: Compulsory Physical Education of Bachelor Program Informatics, in Czech, Version 2015

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
TV1	Physical Education	Z	0	0+2	Z	PT
TVV	Physical education	Z	0	0+2	Z,L	PT
TVV0	Physical education	Z	0	0+2	Z,L	PT
TV2	Physical Education	Z	0	0+2	L	PT
TVKZV	Physical Education Course	Z	0	7dní	Z	PT
TVKLV	Physical Education Course	Z	0	7dní	L	PT

Characteristics of the courses of this group of Study Plan: Code=BI-PT.2015 Name=Compulsory Physical Education of Bachelor Program Informatics, in Czech, Version 2015

TV1	Physical Education	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0
TVKZV	Physical Education Course	Z	0
TVKLV	Physical Education Course	Z	0

Name of the block: Compulsory elective humanities courses

Minimal number of credits of the block: 2

The role of the block: VH

Code of the group: BI-PV-HU.2015

Name of the group: Compulsory Elective Humanity Courses of Bachelor Study Program Informatics, in Czech, Version 2015

Requirement credits in the group: In this group you have to gain at least 2 credits (at most 6)

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

Credits in the group: 2

Note on the group: Faculty guarantees the availability of these modules.

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
FI-FIL	<b>Philosophy</b> Peter Zamarovský Michal Valenta Peter Zamarovský (Gar.)	ZK	2	2+0	Z,L	VH
BI-HMI	<b>History of Mathematics and Informatics</b> Alena Šolcová Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	VH
FI-HTE	<b>History of Technology and Economics</b> Marcela Efmertová Michal Valenta Marcela Efmertová (Gar.)	ZK	2	2+0	Z,L	VH
FI-HPZ	<b>Humanities subject from a study abroad</b> Miroslav Balík	Z	3	0+0	Z,L	VH
FI-MPL	<b>Managerial Psychology</b> Jan Fiala, Marek Procházka Jan Fiala (Gar.)	ZK	2	2+0	Z,L	VH
BI-EHD	<b>Introduction to European Economic History</b> Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z	VH
FI-KSA	<b>Cultural and Social Anthropology</b> Tomáš Houdek, Alena Libánská Tomáš Houdek Alena Libánská (Gar.)	ZK	2	2+0	L,Z	VH
FI-ULI	<b>Introduction to Linguistics for Computer</b> Václav Cvrček Michal Valenta Václav Cvrček (Gar.)	ZK	2	2+0	L	VH
FI-GNO	<b>Introduction to Gnoseology</b> Ivo Janoušek Michal Valenta Ivo Janoušek (Gar.)	ZK	2	2+0	L	VH

Characteristics of the courses of this group of Study Plan: Code=BI-PV-HU.2015 Name=Compulsory Elective Humanity Courses of Bachelor Study Program Informatics, in Czech, Version 2015

FI-FIL see A0B16	Philosophy	ZK	2
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BI-HMI	History of Mathematics and Informatics This course is presented in Czech.	Z,ZK	3
FI-HTE	History of Technology and Economics The course introduces the scientific disciplines of history and technology, economic and social history of the Czech lands and Czechoslovakia in comparison with the development of the European region 19 to 21 century.	ZK	2
FI-HPZ	Humanities subject from a study abroad A "Humanities subject that has been studied abroad" is covered by the Humanities subject from a study abroad in Compulsory Humanities Module that is required in the curriculum. The substitution is approved by the Vice-Dean for study affairs on behalf of the Dean at the request of the student.	Z	3
FI-MPL	Managerial Psychology	ZK	2
BI-EHD	Introduction to European Economic History This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	3
FI-KSA	Cultural and Social Anthropology The one-semester course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity of the world - examples from anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, material culture, language, health, history, death, etc ...) will be shown. The course is an interesting alternative to other humanities, taught at FIT.	ZK	2
FI-ULI	Introduction to Linguistics for Computer This course is presented in Czech.	ZK	2
FI-GNO	Introduction to Gnoseology Předmět studenty uvádí do teorie poznání, systémovým pohledem nahlíží na pole kultury, na vztahy a rozdíly mezi přírodními a humánními obory, vědou a uměním. Rozborem dějin modernismu a myšlenkových proudů 20. století jsou ukázány proměny paradigmat a převrat k postmodernismu, analýzou paralelismů ve vědě a umění odhaleny mechanismy tvůrčích procesů. V návaznosti na teorii přírodních jazyků a sémiotiky je vedena diskuze i o kognitivních procesech, v historickém přehledu nastíněna hlediska estetického vnímání. Samostatnou kapitolou jsou modely spojených přírodních soustav a systémů, v závěru přednášek je pozornost věnována filozofii vědy a otázkám udržitelného rozvoje. Předmět přednáší a garantuje Ing. Ivo Janoušek CSc.	ZK	2

Name of the block: Elective courses

Minimal number of credits of the block: 0

The role of the block: V

Code of the group: BI-V-PRO\_MG

Name of the group: Elective Courses, Suitable for those who intend to apply for Master's program at FIT

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group: Courses in this group are recommended for students who intend to enroll to master program at FIT.

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
BI-AG2	<b>Algorithms and Graphs 2</b> Tomáš Valla, Ondřej Suchý Josef Kolář Ondřej Suchý (Gar.)	Z,ZK	5	2P+2C	L	v

Characteristics of the courses of this group of Study Plan: Code=BI-V-PRO\_MG Name=Elective Courses, Suitable for those who intend to apply for Master's program at FIT

BI-AG2	Algorithms and Graphs 2	Z,ZK	5
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This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow-up on the introduction given in the compulsory course BI-AG1. It further delves into advanced data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.

Code of the group: BI-V.2015

Name of the group: Elective Courses of Bachelor Program Informatics, Presented in Czech, Version 2015

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group: Vedle zde uvedených předmětů si jako volitelný můžete zapsat kterýkoliv předmět, který se nabízí v rámci vašeho studijního programu a formy studia, který jste si nezapsal(a) jako povinný předmět programu, povinný předmět oboru nebo povinně volitelný předmět.

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
BI-ADU.1	<b>Unix Administration</b> Jan Žďárek, Zdeněk Muzikář Zdeněk Muzikář Zdeněk Muzikář (Gar.)	Z,ZK	5	2P+2C	L	v
BI-ALO	<b>Algebra and Logic</b> Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+1C	L	v
BI-A2L	<b>English Language for IT</b> Kateřina Valentová Kateřina Valentová (Gar.)	Z	2	2C	L	v

BI-A0L	<b>English Language 0-2</b> <i>Kateřina Valentov</i>	Z	0	2C	L	v
BI-A1L	<b>English Language 1-2</b> <i>Kateřina Valentov</i>	Z	0	2C	L	v
BI-A2Z	<b>English Language 2-1</b> <i>Kateřina Valentov Kateřina Valentov (Gar.)</i>	Z	0	2C	Z	v
BI-APJ	<b>Application Programming in Java</b> <i>Jiři Danček Michal Valenta Jiři Danček (Gar.)</i>	Z,ZK	4	2P+1R+1C	Z	v
BI-ATS	<b>Automated Testing of Software</b>	Z,ZK	4	0+3	L	v
BI-DAN	<b>Taxes for non-Economists</b> <i>Lucie Kbelov, Savina Finardi Michal Valenta Savina Finardi (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-STO	<b>Storage and Filesystems</b> <i>Jiři Kařpar Tomř Zahradnick Jiři Kařpar (Gar.)</i>	Z,ZK	4	2P+2C	L,Z	v
BI-EP1	<b>Effective programming 1</b> <i>Martin Kačer Martin Kačer Martin Kačer (Gar.)</i>	Z	4	2P+2C	Z	v
BI-EP2	<b>Efficient Programming 2</b> <i>Martin Kačer Martin Kačer Martin Kačer (Gar.)</i>	KZ	4	2P+2C	L	v
BI-EJA	<b>Enterprise Java</b> <i>Jiři Danček Zdenk Troniek Jiři Danček (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-EHA	<b>Ethical Hacking</b> <i>Simona Buchoveck, Jiři Dostl, Jakub Rzika, Jakub cs, Jan Kubna, Tomř Stefan, Martin Kolrik, Tomř Dvořek Jakub Rzika Jakub Rzika (Gar.)</i>	Z,ZK	5	2P+2C	L	v
BI-FTR	<b>Financial Markets</b> <i>Pavla Vozrov</i>	Z,ZK	4	2P+2C	Z,L	v
MI-GLR	<b>Games and reinforcement learning</b> <i>Juan Pablo Maldonado Lopez Pavel Kordk Juan Pablo Maldonado Lopez (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-HWB	<b>Hardware Security</b> <i>Jiři Buek, Filip Kodtek, Rbert Lrencz Rbert Lrencz Rbert Lrencz (Gar.)</i>	Z,ZK	5	2P+2C	Z	v
BI-ARD	<b>Interactive applications on Arduino</b> <i>Jaroslav Boreck, Jiři Cvrek, Janusz Piotr Wijas, Ivo Hleek, Gabriela Hnov, Robert Hlle, David Labsk, Jan Řiha Hana Kubtov Ivo Hleek (Gar.)</i>	KZ	4	3C	L	v
BI-CS2	<b>C# language and data access</b> <i>Pavel Štpn Pavel Štpn (Gar.)</i>	KZ	4	0P+3C	Z	v
BI-PCS	<b>C# language and data access</b> <i>Michal Valenta</i>	KZ	4	0P+3C	L	v
BI-CS3	<b>Language C# - design of web applications</b> <i>Pavel Štpn Pavel Štpn Pavel Štpn (Gar.)</i>	KZ	4	3C	Z	v
BI-SQL.1	<b>Language SQL, advanced</b> <i>Ivan Halařka, Michal Valenta Michal Valenta Michal Valenta (Gar.)</i>	KZ	4	3C	L	v
BI-MEK	<b>Macroeconomic Context of Domestic and World Economy</b> <i>Ivo Straka Michal Valenta Ivo Straka (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-MPP	<b>Methods of interfacing peripheral devices</b> <i>Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-MMP	<b>Multimedia team project</b> <i>Zdeňka echov Michal Valenta Zdeňka echov (Gar.)</i>	KZ	4	3C	L	v
BI-ACM	<b>Programming Practices 1</b> <i>Tomř Valla, Ondřej Such Ivan řimeek Ondřej Such (Gar.)</i>	KZ	5	4C	L	v
BI-ACM2	<b>Programming Practices 2</b> <i>Tomř Valla, Ondřej Such Ivan řimeek Ondřej Such (Gar.)</i>	KZ	5	4C	Z	v
BI-AND	<b>Programming for the Android Operating System</b> <i>Ondřej ermk, Michal Havryluk, Vladislav Skoumal, David Blk Michal Havryluk Michal Havryluk (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-CS1	<b>Programming in C#</b> <i>Helena Wallenfeslov Pavel Štpn (Gar.)</i>	KZ	4	0P+3C	L,Z	v
BI-PJV	<b>Programming in Java</b> <i>Miroslav Balk, Jan Bliznienko, Filip Glazar, Martin Podlouck, Vojtch Knaisl Miroslav Balk Miroslav Balk (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-PJS	<b>JavaScript Programming</b> <i>Michal Valenta</i>	KZ	4	0P+3C	L	v
BI-PJS.1	<b>JavaScript Programming</b> <i>Vojtch Jirkovsk, Nikita Mironov Vojtch Jirkovsk Vojtch Jirkovsk (Gar.)</i>	KZ	4	3C	L	v
BI-PMA	<b>Programming in Mathematics</b> <i>Zdenk Buk Zdenk Buk (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-PHP.1	<b>Programing in PHP</b> <i>Vojtch Jirkovsk, Jan Slfka Tomř Kadlec Vojtch Jirkovsk (Gar.)</i>	KZ	4	3C	Z	v
BI-PYT	<b>Python Programming</b> <i>Jiři Znamenek Michal Valenta Jiři Znamenek (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-PS2	<b>Programming in shell 2</b> <i>Jan Źdrek, Lukř Bařinka Lukř Bařinka Jan Źdrek (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-PRR	<b>Project management</b> <i>Martin Plpitel Martin Plpitel Martin Plpitel (Gar.)</i>	KZ	4	2P+2C	Z	v
BI-PKM	<b>Introduction to mathematics</b> <i>Karel Klouda Karel Klouda (Gar.)</i>	Z	4		Z	v



BI-SCE1	<b>Computer Engineering Seminar I</b> Hana Kubátová, Martin Novotný, Miroslav Skrbek <b>Martin Novotný</b> Hana Kubátová (Gar.)	Z	4	2C	L,Z	v
BI-SCE2	<b>Computer Engineering Seminar II</b> <b>Martin Novotný</b>	Z	4	2C	L,Z	v
BI-SM	<b>Shell Minimum</b> <b>Tomáš Zahradnický</b>	Z	2		Z	v
BI-ST1	<b>Network Technology 1</b> <b>Alexandru Moucha</b> Alexandru Moucha (Gar.)	Z	3	2C	Z	v
BI-ST2	<b>Network Technology 2</b> <b>Alexandru Moucha</b> Alexandru Moucha (Gar.)	Z	3	3C	L	v
BI-ST3	<b>Network Technology 3</b> <b>Alexandru Moucha</b> Alexandru Moucha (Gar.)	Z	3	2C	Z	v
BI-ST4	<b>Network Technology 4</b> <b>Alexandru Moucha</b> Alexandru Moucha (Gar.)	Z	3	2C	L	v
BI-SOJ	<b>Machine Oriented Languages</b> Pavel Cimbál <b>Pavel Cimbál</b> Pavel Cimbál (Gar.)	Z,ZK	4	2P+2C	L	v
BI-SVZ	<b>Computer Vision and Image Processing</b> Marcel Jiřina <b>Jakub Novák</b> Marcel Jiřina (Gar.)	Z,ZK	5	2P+2C	Z	v
BI-SEP	<b>World Economy and Business</b> Tomáš Evan <b>Tomáš Evan</b> Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	v
BI-GIT	<b>Version control system GIT</b> Robin Obůrka, Petr Pulc <b>Petr Pulc</b> Petr Pulc (Gar.)	KZ	2	16P	Z,L	v
BI-TS1	<b>Theoretical Seminar I</b> <b>Jan Janoušek</b> Ondřej Suchý (Gar.)	Z	4	2C	Z	v
BI-TS2	<b>Theoretical Seminar II</b> <b>Tomáš Valla</b> Ondřej Suchý (Gar.)	Z	4	2C	L	v
BI-TS3	<b>Theoretical Seminar III</b> <b>Tomáš Valla</b> Ondřej Suchý (Gar.)	Z	4	2C	Z	v
BI-TS4	<b>Theoretical Seminar IV</b> Tomáš Valla, Ondřej Suchý <b>Jan Janoušek</b> Tomáš Valla (Gar.)	Z	4	2C	L	v
BI-EHD	<b>Introduction to European Economic History</b> Tomáš Evan <b>Tomáš Evan</b> Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z	v
BI-ULI	<b>Introduction to Linux</b> Dana Čermáková, Zdeněk Muzikář <b>Zdeněk Muzikář</b> Zdeněk Muzikář (Gar.)	Z	2	2C	Z	v
BI-VMM	<b>Selected Mathematical Methods</b> Tomáš Kalvoda, František Štampach <b>František Štampach</b> Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	v
BI-ZIVS	<b>Intelligent Embedded System Fundamentals</b> Miroslav Skrbek <b>Miroslav Skrbek</b> Miroslav Skrbek (Gar.)	KZ	4	1P+3C	Z	v
BI-MIK	<b>Fundamentals of Microeconomics</b> Pavla Vozárová <b>Pavla Vozárová</b> Pavla Vozárová (Gar.)	Z,ZK	4	2P+2C	Z	v
BI-ZPI	<b>Process engineering</b> Robert Pergl <b>Robert Pergl</b> Robert Pergl (Gar.)	KZ	4	1P+2C	L	v
BI-ZUM	<b>Artificial Intelligence Fundamentals</b> Pavel Surynek <b>Tomáš Rehořek</b> Pavel Surynek (Gar.)	Z,ZK	4	2P+2C	L	v
BI-IOS	<b>Fundamentals of iOS Application Development for iPhone and iPad</b> Martin Půlpitel, Dominik Veselý <b>Jakub Hladík</b> Martin Půlpitel (Gar.)	KZ	4	2C	Z	v
BI-ZWU	<b>Introduction to Web and User Interfaces</b> Lukáš Bařinka, Jakub Klímeč, Jiří Pavelka <b>Jiří Pavelka</b> Jakub Klímeč (Gar.)	Z,ZK	4	2P+2C	L	v
BI-3DT.1	<b>3D Printing</b> Jiří Hanuš, Marián Hlaváč, Miroslav Hrončok, Jakub Průša, Tomáš Sýkora, Janusz Piotr Wijas, Tomáš Sýkora <b>Marek Žehra</b> Miroslav Hrončok (Gar.)	KZ	4	3C	L	v

**Characteristics of the courses of this group of Study Plan: Code=BI-V.2015 Name=Elective Courses of Bachelor Program Informatics, Presented in Czech, Version 2015**

BI-ADU.1	Unix Administration This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	5
BI-HWB	Hardware Security This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	5
BI-DAN	Taxes for non-Economists Taxes, including social insurance contributions, are obligatory payments paid by people or institutions to public budgets. This is the way how a significant portion of GDP is redistributed. This course concerns who pays which taxes or who bears the tax burden. The course introduces students to the tax theory and policy fundamentals and shows how they affect taxation of income, consumption, and wealth. The course provides practical information on calculations of tax liabilities of both citizens and institutions as well as information about important taxpayers' formal duties towards public administration.	Z,ZK	4
BI-MEK	Macroeconomic Context of Domestic and World Economy This course is presented in Czech.	Z,ZK	4
BI-PRR	Project management This course is presented in Czech.	KZ	4
BI-SEP	World Economy and Business This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	Z,ZK	4

BI-MIK	Fundamentals of Microeconomics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
BI-EHD	Introduction to European Economic History This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	3
BI-ALO	Algebra and Logic The course extends and deepens the study of topics touched upon in the basic logic course. Using the unification algorithm and the resolution method we show the link to logic programming. Using set theory, arithmetics, and simple algebraic theories as examples, we present applications of mathematical logic in mathematics and computer science.	Z,ZK	4
BI-A2L	English Language for IT	Z	2
BI-A0L	English Language 0-2	Z	0
BI-A1L	English Language 1-2 This course is opened in every summer semester. It is designed for students attending the bachelor degree programme, whose language knowledge and skills are on a pre-intermediate or intermediate level. Students enroll on this course predominantly in 1st, eventually 2nd or 3rd year of study. The output level of this course corresponds to Level B1 within the Common European Framework of Reference for Languages (CEFR). On completion of this course students are supposed to enroll on the course BI-A2Z in the following winter semester and then on BI-A2L in the following summer semester, followed by a compulsory examination on Level B2 within CEFR. To choose the right course level the student should consider how many semesters he/she needs to prepare for the examination properly. Course objective: The course focuses on practising basic grammar issues (morphology including the entire tense system; basic sentence constructions) and building communicative skills applied to both everyday and professional topics.	Z	0
BI-A2Z	English Language 2-1	Z	0
BI-APJ	Application Programming in Java This course is presented in Czech. Advanced technologies in Java.	Z,ZK	4
BI-ATS	Automated Testing of Software This course is presented in Czech.	Z,ZK	4
BI-STO	Storage and Filesystems The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archiving, as so as storage scaling, load balancing and high availability.	Z,ZK	4
BI-EP1	Effective programming 1 The course is taught in Czech.	Z	4
BI-EP2	Efficient Programming 2 Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individual problems are discussed, with the aim to choose the best one and avoid implementation errors.	KZ	4
BI-EJA	Enterprise Java The course is on advanced technologies in the Java programming language. The focus is on technologies for development of enterprise information systems which are connected to a database and are accessed through the web interface.	Z,ZK	4
BI-EHA	Ethical Hacking The course gives a professional and academic introduction to computer and information security using the ethical hacking approach, which enables improved defence thanks to adopting an attacker mindset when discovering vulnerabilities, hands-on experience with different attacks, facilitates linking theory and practice in significant areas of one's digital literacy, and can therefore be utilized by (future) security professionals, (informed) decision-makers, (savvy) users and developers alike. This course is taught in English.	Z,ZK	5
BI-FTR	Financial Markets Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.	Z,ZK	4
MI-GLR	Games and reinforcement learning The field of reinforcement learning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intelligence. This course is intended to give you both theoretical and practical background so you can participate in related research activities. Presented in English.	Z,ZK	4
BI-ARD	Interactive applications on Arduino The subject is designed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applications for modern programmable kits and control varied peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded systems, i.e. to see the results not only on display of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore is suitable even for Web and Software Engineering students.	KZ	4
BI-CS2	C# language and data access The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description).	KZ	4
BI-PCS	C# language and data access The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description).	KZ	4
BI-CS3	Language C# - design of web applications The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of the development possibilities on this platform. They will learn to create WebAPI and to use it by client programs.	KZ	4
BI-SQL.1	Language SQL, advanced Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In particular stored program unites, triggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of view of specialized database structures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan and possibilities of its. changes will be discussed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle DBMS and partially on PostgreSQL.	KZ	4

BI-MPP	Methods of interfacing peripheral devices	Z,ZK	4
The course is focused on methods interfacing peripheral devices. Interfacing of real devices is included with stress to Universal serial bus (USB). The course includes either PC side or attached devices. Labs are practically oriented. Students gain gain experience in implementation relevant parts of USB device, Linux and Windows drivers, simple application development, and APIs of selected devices.			
BI-MMP	Multimedia team project	KZ	4
This course is presented in Czech.			
BI-ACM	Programming Practices 1	KZ	5
This course is presented in Czech.			
BI-ACM2	Programming Practices 2	KZ	5
This course is presented in Czech.			
BI-AND	Programming for the Android Operating System	Z,ZK	4
This course is presented in Czech.			
BI-CS1	Programming in C#	KZ	4
The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental construction, types of variables, operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition and class instancing, constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and exception processing, as well as work with files are emphasized.			
BI-PJV	Programming in Java	Z,ZK	4
The course is taught in Czech.			
BI-PJS	JavaScript Programming	KZ	4
This course is presented in Czech.			
BI-PJS.1	JavaScript Programming	KZ	4
Main goal of the course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development in Javascript. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 4th semester of study.			
BI-PMA	Programming in Mathematica	Z,ZK	4
Students will be working with modern technical and scientific software. Students will learn how to use different programming styles (functional programming, rule-based programming, etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.			
BI-PHP.1	Programing in PHP	KZ	4
The course is taught in Czech.. Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices and will use tool that eases development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 3rd semester of study.			
BI-PYT	Python Programming	Z,ZK	4
The course is taught in Czech.			
BI-PS2	Programming in shell 2	Z,ZK	4
Students gain a general overview of available scripting languages, their syntax, semantics, programming style, pros and cons. In addition, they gain a deeper insight into shell and some other particular scripting languages and will get practical experience with shell script programming.			
BI-PKM	Introduction to mathematics	Z	4
This course is presented in Czech.			
BI-SCE1	Computer Engineering Seminar I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.			
BI-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.			
BI-SM	Shell Minimum	Z	2
This module covers selected elementary programming skills in Bourne Again shell.			
BI-ST1	Network Technology 1	Z	3
The subject is oriented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is accredited under the Cisco Netacad - CCNA1 - R&S Introduction to Networks.			
BI-ST2	Network Technology 2	Z	3
This course is presented in Czech.			
BI-ST3	Network Technology 3	Z	3
Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses will get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc.			
BI-ST4	Network Technology 4	Z	3
Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely other type of network (Non Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch firmware, perform password recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation ways while maintaining the network running.			
BI-SOJ	Machine Oriented Languages	Z,ZK	4
Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal use of microprocessor's features and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view linked to higher level languages. This knowledge will be used during reverse engineering, optimization, and evaluation of code security.			

BI-SVZ	Computer Vision and Image Processing	Z,ZK	5
Camera systems become a common part of life by being universally available. This phenomenon also relates to the need to process and evaluate image information. The subject acquaints students with different types of camera systems and with a variety of image and video processing methods. The course is focused on the use of camera systems for solving practical problems, which students can meet in a real life.			
BI-GIT	Version control system GIT	KZ	2
Students will be introduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and practically. In this particular system even the implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git server administrators.			
BI-TS1	Theoretical Seminar I	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the potentials of the teachers of the seminar.			
BI-TS2	Theoretical Seminar II	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the potentials of the teachers of the seminar.			
BI-TS3	Theoretical Seminar III	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the potentials of the teachers of the seminar.			
BI-TS4	Theoretical Seminar IV	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the potentials of the teachers of the seminar.			
BI-ULI	Introduction to Linux	Z	2
Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).			
BI-VMM	Selected Mathematical Methods	Z,ZK	4
We start reviewing geometric properties of linear spaces with inner product. Next, we introduce and analyze the discrete Fourier transform (DFT) and its fast implementation (FFT). Further we deal with differential calculus of functions involving multiple variables. We present methods for the localization of extreme values of functions. For this purposes, we study normed linear spaces and quadratic forms. In addition, we introduce the least square method. The last part of the course is devoted to optimization and duality. The linear programming and the Simplex method is analyzed in more detail.			
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies.			
BI-ZPI	Process engineering	KZ	4
Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise.			
BI-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well.			
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presented in Czech.			
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
This course is presented in Czech.			
BI-3DT.1	3D Printing	KZ	4

Code of the group: BI-V.2017

Name of the group: Purely Elective Courses of Bachelor Programme BI, Version 2017

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Volitelné předměty, které nejsou povinnými v programu ani žádného oboru či zaměření

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
BI-ALO	<b>Algebra and Logic</b> <i>Jan Starý Jan Starý Jan Starý (Gar.)</i>	Z,ZK	4	2P+1C	L	v
BI-A2L	<b>English Language for IT</b> <i>Kateřina Valentová Kateřina Valentová (Gar.)</i>	Z	2	2C	L	v
BI-A0Z	<b>English Language 0-1</b> <i>Kateřina Valentová Kateřina Valentová (Gar.)</i>	Z	0	2C	Z	v
BI-A0L	<b>English Language 0-2</b> <i>Kateřina Valentová</i>	Z	0	2C	L	v

BI-A1Z	<b>English Language 1-1</b> <i>Kateřina Valentov Kateřina Valentov (Gar.)</i>	Z	0	2C	Z	v
BI-A1L	<b>English Language 1-2</b> <i>Kateřina Valentov</i>	Z	0	2C	L	v
BI-A2Z	<b>English Language 2-1</b> <i>Kateřina Valentov Kateřina Valentov (Gar.)</i>	Z	0	2C	Z	v
BI-APJ	<b>Application Programming in Java</b> <i>Jiř Danček Michal Valenta Jiř Danček (Gar.)</i>	Z,ZK	4	2P+1R+1C	Z	v
BIE-ZUM	<b>Artificial Intelligence Fundamentals</b> <i>Pavel Surynek Tomš Řehořek Pavel Surynek (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-ATS	<b>Automated Testing of Software</b>	Z,ZK	4	0+3	L	v
BI-BLE	<b>Blender</b> <i>Luks Bařinka Luks Bařinka Luks Bařinka (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-STO	<b>Storage and Filesystems</b> <i>Jiř Kařpar Tomš Zahradnick Jiř Kařpar (Gar.)</i>	Z,ZK	4	2P+2C	L,Z	v
BI-EP1	<b>Effective programming 1</b> <i>Martin Kačer Martin Kačer Martin Kačer (Gar.)</i>	Z	4	2P+2C	Z	v
BI-EP2	<b>Efficient Programming 2</b> <i>Martin Kačer Martin Kačer Martin Kačer (Gar.)</i>	KZ	4	2P+2C	L	v
BI-EJA	<b>Enterprise Java</b> <i>Jiř Danček Zdenk Tronček Jiř Danček (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-EHA	<b>Ethical Hacking</b> <i>Šimona Buchoveck, Jiř Dostl, Jakub Rzička, Jakub cs, Jan Kubna, Tomš Stefan, Martin Kolrk, Tomš Dvořček Jakub Rzička Jakub Rzička (Gar.)</i>	Z,ZK	5	2P+2C	L	v
BI-FMU	<b>Financial and Management Accounting</b> <i>David Buchtela David Buchtela David Buchtela (Gar.)</i>	Z,ZK	5	2P+2C	Z	v
BI-HMI	<b>History of Mathematics and Informatics</b> <i>Alena Šolcov Alena Šolcov Alena Šolcov (Gar.)</i>	Z,ZK	3	2P+1C	L	v
BI-ARD	<b>Interactive applications on Arduino</b> <i>Jaroslav Boreck, Jiř Cvrek, Janusz Piotr Wijas, Ivo Hleček, Gabriela Hnov, Robert Hlle, David Labsk, Jan Řha Hana Kubtov Ivo Hleček (Gar.)</i>	KZ	4	3C	L	v
BIE-IMA2	<b>Introduction to Mathematics 2</b> <i>Karel Klouda</i>	Z	2	1C	Z	v
BI-PCS	<b>C# language and data access</b> <i>Michal Valenta</i>	KZ	4	0P+3C	L	v
BI-CS2	<b>C# language and data access</b> <i>Pavel Štpn Pavel Štpn (Gar.)</i>	KZ	4	0P+3C	Z	v
BI-CS3	<b>Language C# - design of web applications</b> <i>Pavel Štpn Pavel Štpn Pavel Štpn (Gar.)</i>	KZ	4	3C	Z	v
BI-SQL.1	<b>Language SQL, advanced</b> <i>Ivan Halařka, Michal Valenta Michal Valenta Michal Valenta (Gar.)</i>	KZ	4	3C	L	v
BI-MPP	<b>Methods of interfacing peripheral devices</b> <i>Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-MMP	<b>Multimedia team project</b> <i>Zdeřka echov Michal Valenta Zdeřka echov (Gar.)</i>	KZ	4	3C	L	v
BI-ACM	<b>Programming Practices 1</b> <i>Toms Valla, Ondřej Such Ivan Šimeček Ondřej Such (Gar.)</i>	KZ	5	4C	L	v
BI-ACM2	<b>Programming Practices 2</b> <i>Toms Valla, Ondřej Such Ivan Šimeček Ondřej Such (Gar.)</i>	KZ	5	4C	Z	v
BI-ACM3	<b>Programming Practices 3</b> <i>Toms Valla, Ondřej Such Ivan Šimeček Toms Valla (Gar.)</i>	KZ	5	4C	L	v
BI-ACM4	<b>Programming Practices 4</b> <i>Toms Valla, Ondřej Such Toms Valla Toms Valla (Gar.)</i>	KZ	5	4C	Z	v
BI-AND	<b>Programming for the Android Operating System</b> <i>Ondřej ermk, Michal Havryluk, Vladislav Skoumal, David Blk Michal Havryluk Michal Havryluk (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-CS1	<b>Programming in C#</b> <i>Helena Wallenfelsov Pavel Štpn (Gar.)</i>	KZ	4	0P+3C	L,Z	v
BI-PJV	<b>Programming in Java</b> <i>Miroslav Balk, Jan Bliznienko, Filip Glazar, Martin Podlouck, Vojtch Knaisl Miroslav Balk Miroslav Balk (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-PJS.1	<b>JavaScript Programming</b> <i>Vojtch Jirkovsk, Nikita Mironov Vojtch Jirkovsk Vojtch Jirkovsk (Gar.)</i>	KZ	4	3C	L	v
BI-KOT	<b>Programing in Kotlin</b> <i>Jiř Danček Jiř Danček Jiř Danček (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-PMA	<b>Programming in Mathematica</b> <i>Zdenk Buk Zdenk Buk (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-PHP.1	<b>Programing in PHP</b> <i>Vojtch Jirkovsk, Jan Slfka Toms Kadlec Vojtch Jirkovsk (Gar.)</i>	KZ	4	3C	Z	v
BI-PKM	<b>Introduction to mathematics</b> <i>Karel Klouda Karel Klouda (Gar.)</i>	Z	4		Z	v
BI-SCE1	<b>Computer Engineering Seminar I</b> <i>Hana Kubtov, Martin Novotn, Miroslav Skrbek Martin Novotn Hana Kubtov (Gar.)</i>	Z	4	2C	L,Z	v

BI-SCE2	<b>Computer Engineering Seminar II</b> <i>Martin Novotný</i>	Z	4	2C	L,Z	v
BI-ST1	<b>Network Technology 1</b> <i>Alexandru Moucha Alexandru Moucha (Gar.)</i>	Z	3	2C	Z	v
BI-ST2	<b>Network Technology 2</b> <i>Alexandru Moucha Alexandru Moucha (Gar.)</i>	Z	3	3C	L	v
BI-ST3	<b>Network Technology 3</b> <i>Alexandru Moucha Alexandru Moucha (Gar.)</i>	Z	3	2C	Z	v
BI-ST4	<b>Network Technology 4</b> <i>Alexandru Moucha Alexandru Moucha (Gar.)</i>	Z	3	2C	L	v
BI-SOJ	<b>Machine Oriented Languages</b> <i>Pavel Cimbál Pavel Cimbál Pavel Cimbál (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-SVZ	<b>Computer Vision and Image Processing</b> <i>Marcel Jiřina Jakub Novák Marcel Jiřina (Gar.)</i>	Z,ZK	5	2P+2C	Z	v
BI-GIT	<b>Version control system GIT</b> <i>Robin Obůrka, Petr Pulc Petr Pulc Petr Pulc (Gar.)</i>	KZ	2	16P	Z,L	v
BI-TS1	<b>Theoretical Seminar I</b> <i>Jan Janoušek Ondřej Suchý (Gar.)</i>	Z	4	2C	Z	v
BI-TS2	<b>Theoretical Seminar II</b> <i>Tomáš Valla Ondřej Suchý (Gar.)</i>	Z	4	2C	L	v
BI-TS3	<b>Theoretical Seminar III</b> <i>Tomáš Valla Ondřej Suchý (Gar.)</i>	Z	4	2C	Z	v
BI-TS4	<b>Theoretical Seminar IV</b> <i>Tomáš Valla, Ondřej Suchý Jan Janoušek Tomáš Valla (Gar.)</i>	Z	4	2C	L	v
BI-TDA	<b>Test driven architecture</b> <i>Marek Hakala Marek Hakala Marek Hakala (Gar.)</i>	KZ	4	2P+1C	Z,L	v
BI-TEX	<b>TeX and Typography</b> <i>Petr Olšák Petr Olšák Petr Olšák (Gar.)</i>	Z,ZK	4	2P+1C	L	v
BI-UDZ	<b>Introduction to Audio Digitization</b> <i>Tomáš Zahradnický</i>	ZK	2	2P	Z	v
BI-ULI	<b>Introduction to Linux</b> <i>Dana Čermáková, Zdeněk Muzikář Zdeněk Muzikář Zdeněk Muzikář (Gar.)</i>	Z	2	2C	Z	v
BI-OPT	<b>Introduction to Optical Networks</b> <i>Jan Radil Jan Radil Pavel Tvrdek (Gar.)</i>	Z,ZK	4	2P+1C	Z	v
BI-VHS	<b>Virtual game-worlds</b> <i>Radek Richtř</i>	ZK	4	2P+2C	Z	v
BI-VR1	<b>Virtual reality I</b> <i>Petr Pauš, Petr Klán Petr Klán Petr Klán (Gar.)</i>	KZ	4	2P+2C	L,Z	v
BI-VMM	<b>Selected Mathematical Methods</b> <i>Tomáš Kalvoda, František Štampach František Štampach Tomáš Kalvoda (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-ZS10	<b>Bachelor internship abroad for 10 credits</b> <i>Miroslav Balík Miroslav Balík (Gar.)</i>	Z	10		Z,L	v
BI-ZS20	<b>Bachelor internship abroad for 20 credits</b> <i>Miroslav Balík Miroslav Balík (Gar.)</i>	Z	20		Z,L	v
BI-ZS30	<b>Bachelor internship abroad for 30 credits</b> <i>Miroslav Balík Miroslav Balík (Gar.)</i>	Z	30		Z,L	v
BI-ZIVS	<b>Intelligent Embedded System Fundamentals</b> <i>Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)</i>	KZ	4	1P+3C	Z	v
BI-ZPI	<b>Process engineering</b> <i>Robert Pergl Robert Pergl Robert Pergl (Gar.)</i>	KZ	4	1P+2C	L	v
BI-ZNF	<b>PHP Framework Nette - basics</b> <i>Jiří Chludil, Jindřich Máca Jiří Chludil Jiří Chludil (Gar.)</i>	KZ	3	2P+1C	L	v
BI-ZRS	<b>Basics of System Control</b> <i>Kateřina Hyniová Kateřina Hyniová Kateřina Hyniová (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-IOS	<b>Fundamentals of iOS Application Development for iPhone and iPad</b> <i>Martin Půlpitel, Dominik Veselý Jakub Hladík Martin Půlpitel (Gar.)</i>	KZ	4	2C	Z	v
BI-ZWU	<b>Introduction to Web and User Interfaces</b> <i>Lukáš Bařinka, Jakub Klímek, Jiří Pavelka Jiří Pavelka Jakub Klímek (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-3DT.1	<b>3D Printing</b> <i>Jiří Hanuš, Marián Hlaváč, Miroslav Hrončok, Jakub Průša, Tomáš Sýkora, Janusz Piotr Wijas, Tomáš Sýkora Marek Žehra Miroslav Hrončok (Gar.)</i>	KZ	4	3C	L	v

**Characteristics of the courses of this group of Study Plan: Code=BI-V.2017 Name=Purely Elective Courses of Bachelor Programme BI, Version 2017**

BI-HMI	History of Mathematics and Informatics This course is presented in Czech.	Z,ZK	3
BI-ALO	Algebra and Logic The course extends and deepens the study of topics touched upon in the basic logic course. Using the unification algorithm and the resolution method we show the link to logic programming. Using set theory, arithmetics, and simple algebraic theories as examples, we present applications of mathematical logic in mathematics and computer science.	Z,ZK	4
BI-A2L	English Language for IT	Z	2
BI-A0L	English Language 0-2	Z	0

BI-A1L	English Language 1-2	Z	0
This course is opened in every summer semester. It is designed for students attending the bachelor degree programme, whose language knowledge and skills are on a pre-intermediate or intermediate level. Students enroll on this course predominantly in 1st, eventually 2nd or 3rd year of study. The output level of this course corresponds to Level B1 within the Common European Framework of Reference for Languages (CEFR). On completion of this course students are supposed to enroll on the course BI-A2Z in the following winter semester and then on BI-A2L in the following summer semester, followed by a compulsory examination on Level B2 within CEFR. To choose the right course level the student should consider how many semesters he/she needs to prepare for the examination properly. Course objective: The course focuses on practising basic grammar issues (morphology including the entire tense system; basic sentence constructions) and building communicative skills applied to both everyday and professional topics.			
BI-A2Z	English Language 2-1	Z	0
BI-APJ	Application Programming in Java	Z,ZK	4
This course is presented in Czech. Advanced technologies in Java.			
BI-ATS	Automated Testing of Software	Z,ZK	4
This course is presented in Czech.			
BI-STO	Storage and Filesystems	Z,ZK	4
The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archiving, as so as storage scaling, load balancing and high availability.			
BI-EP1	Effective programming 1	Z	4
The course is taught in Czech.			
BI-EP2	Efficient Programming 2	KZ	4
Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individual problems are discussed, with the aim to choose the best one and avoid implementation errors.			
BI-EJA	Enterprise Java	Z,ZK	4
The course is on advanced technologies in the Java programming language. The focus is on technologies for development of enterprise information systems which are connected to a database and are accessed through the web interface.			
BI-EHA	Ethical Hacking	Z,ZK	5
The course gives a professional and academic introduction to computer and information security using the ethical hacking approach, which enables improved defence thanks to adopting an attacker mindset when discovering vulnerabilities, hands-on experience with different attacks, facilitates linking theory and practice in significant areas of one's digital literacy, and can therefore be utilized by (future) security professionals, (informed) decision-makers, (savvy) users and developers alike. This course is taught in English.			
BI-ARD	Interactive applications on Arduino	KZ	4
The subject is designed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applications for modern programmable kits and control varied peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded systems, i.e. to see the results not only on display of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore is suitable even for Web and Software Engineering students.			
BI-CS2	C# language and data access	KZ	4
The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description).			
BI-PCS	C# language and data access	KZ	4
The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description).			
BI-CS3	Language C# - design of web applications	KZ	4
The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of the development possibilities on this platform. They will learn to create WebAPI and to use it by client programs.			
BI-SQL.1	Language SQL, advanced	KZ	4
Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In particular stored program units, triggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of view of specialized database structures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan and possibilities of its. changes will be discussed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle DBMS and partially on PostgreSQL.			
BI-MPP	Methods of interfacing peripheral devices	Z,ZK	4
The course is focused on methods interfacing peripheral devices. Interfacing of real devices is included with stress to Universal serial bus (USB). The course includes either PC side or attached devices. Labs are practically oriented. Students gain gain experience in implementation relevant parts of USB device, Linux and Windows drivers, simple application development, and APIs of selected devices.			
BI-MMP	Multimedia team project	KZ	4
This course is presented in Czech.			
BI-ACM	Programming Practices 1	KZ	5
This course is presented in Czech.			
BI-ACM2	Programming Practices 2	KZ	5
This course is presented in Czech.			
BI-AND	Programming for the Android Operating System	Z,ZK	4
This course is presented in Czech.			
BI-CS1	Programming in C#	KZ	4
The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental construction, types of variables, operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition and class instancing, constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and exception processing, as well as work with files are emphasized.			

BI-PJV	Programming in Java The course is taught in Czech.	Z,ZK	4
BI-PJS.1	JavaScript Programming Main goal of the course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development in Javascript. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 4th semester of study.	KZ	4
BI-PMA	Programming in Mathematica Students will be working with modern technical and scientific software. Students will learn how to use different programming styles (functional programming, rule-based programming, etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.	Z,ZK	4
BI-PHP.1	Progaraming in PHP The course is taught in Czech.. Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices and will use tool that eases development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 3rd semester of study.	KZ	4
BI-PKM	Introduction to mathematics This course is presented in Czech.	Z	4
BI-SCE1	Computer Engineering Seminar I The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.	Z	4
BI-SCE2	Computer Engineering Seminar II The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.	Z	4
BI-ST1	Network Technology 1 The subject is oriented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is accredited under the Cisco Netacad - CCNA1 - R&S Introduction to Networks.	Z	3
BI-ST2	Network Technology 2 This course is presented in Czech.	Z	3
BI-ST3	Network Technology 3 Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses will get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc.	Z	3
BI-ST4	Network Technology 4 Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely other type of network (Non Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch firmware, perform password recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation ways while maintaining the network running.	Z	3
BI-SOJ	Machine Oriented Languages Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal use of microprocessor's features and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of Oses from the application point of view linked to higher level languages. This knowledge will be used during reverse engineering, optimization, and evaluation of code security.	Z,ZK	4
BI-SVZ	Computer Vision and Image Processing Camera systems become a common part of life by being universally available. This phenomenon also relates to the need to process and evaluate image information. The subject acquaints students with different types of camera systems and with a variety of image and video processing methods. The course is focused on the use of camera systems for solving practical problems, which students can meet in a real life.	Z,ZK	5
BI-GIT	Version control system GIT Students will be introduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and practically. In this particular system even the implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git server administrators.	KZ	2
BI-TS1	Theoretical Seminar I Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	Z	4
BI-TS2	Theoretical Seminar II Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	Z	4
BI-TS3	Theoretical Seminar III Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	Z	4
BI-TS4	Theoretical Seminar IV Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	Z	4
BI-ULI	Introduction to Linux Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).	Z	2



BI-VMM	Selected Mathematical Methods	Z,ZK	4
We start reviewing geometric properties of linear spaces with inner product. Next, we introduce and analyze the discrete Fourier transform (DFT) and its fast implementation (FFT). Further we deal with differential calculus of functions involving multiple variables. We present methods for the localization of extreme values of functions. For this purposes, we study normed linear spaces and quadratic forms. In addition, we introduce the least square method. The last part of the course is devoted to optimization and duality. The linear programming and the Simplex method is analyzed in more detail.			
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies.			
BI-ZPI	Process engineering	KZ	4
Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise.			
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad	KZ	4
This course is presented in Czech.			
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
This course is presented in Czech.			
BI-3DT.1	3D Printing	KZ	4
BI-A0Z	English Language 0-1	Z	0
BI-A1Z	English Language 1-1	Z	0
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well.			
BI-BLE	Blender	Z,ZK	4
The course extends knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those interested in 3D graphics and animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphics applications) course.			
BI-FMU	Financial and Management Accounting	Z,ZK	5
The aim of the course is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the particular accounting operations, operations in accounts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification of bookkeeping, description of economic operations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of management accounting are base of Business Intelligence moduls in Business information systems.			
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples.			
BI-ACM3	Programming Practices 3	KZ	5
This course is presented in Czech.			
BI-ACM4	Programming Practices 4	KZ	5
This course is presented in Czech.			
BI-KOT	Programing in Kotlin	Z,ZK	4
Kotlin is a modern, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of advanced language constructions. The language is fully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a modern, object-functional way with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).			
BI-TDA	Test driven architecture	KZ	4
The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that are well known in the DevOps world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur in the semester project.			
BI-TEX	TeX and Typography	Z,ZK	4
This course is presented in Czech.			
BI-UDZ	Introduction to Audio Digitization	ZK	2
Students will learn how we understand sound from a physical perspective. Next they will familiarize with audio conversion from its physical representation into analog, and later by sampling, into a digital form. Students will have a possibility to gain insight at how the subsequent audio processing works by means of audio fitration and effects, and will learn which file formats are used in both uncompressed (WAV) and compressed audio such as MPEG Audio Layer 3 work. Later in the course, students will familiarize with speech synthesis and speech-to-text recognition. A practical aspects of sound identification, such as during investigation and forensics, will also be discussed. The final lecture will be dedicated to the world of music.			
BI-OPT	Introduction to Optical Networks	Z,ZK	4
Students get basic overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on possible problems with deployment of optical network technology and on their solutions. The course will include the history of optical communications, an overview of passive components (optical fibres, multiplexors, dispersion compensators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission systems). The course will also cover the most up-to-date topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as the accurate time on Internet, ultrastable frequency transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters. Students will solve real tasks from practice.			
BI-VHS	Virtual game-worlds	ZK	4
The course leads students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,...). This current students knowledge is furthermore complemented by the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. The course can be followed by the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.			
BI-VR1	Virtual reality I	KZ	4
Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of virtual worlds communication. The course focuses on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds and improves computational thinking and shared social activities.			

BI-ZS10	Bachelor internship abroad for 10 credits	Z	10
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.			
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.			
BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.			
BI-ZNF	PHP Framework Nette - basics	KZ	3
Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language.			
BI-ZRS	Basics of System Control	Z,ZK	4
Optional subject Basics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the field of automatic control will be definitely evaluated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will teach you description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course in which students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful examples and practical industrial implementations.			

Code of the group: BI-BIT-VO.2017

Name of the group: Elective Vocational Courses for a Bachelor Branch BI-BIT, Version 2017

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group:

Všechny povinné předměty oborů a zaměření s výjimkou tohoto oboru

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
BI-AG2	<b>Algorithms and Graphs 2</b> Tomáš Valla, Ondřej Suchý <b>Josef Kolář</b> Ondřej Suchý (Gar.)	Z,ZK	5	2P+2C	L	v
BI-BIG	<b>DB Technologies for Big Data</b> Josef Gattermayer <b>Josef Gattermayer</b> Josef Gattermayer (Gar.)	KZ	4	2P+2C	Z	v
BI-JPO	<b>Computer Units</b> Pavel Kubalík, Alois Pluháček <b>Alois Pluháček</b> Alois Pluháček (Gar.)	Z,ZK	5	2P+2C	Z	v
BI-KOM	<b>Conceptual Modelling</b> Robert Pergl, Nikola Rytířová, Marek Suchánek, Ondřej Král <b>Robert Pergl</b> Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	v
BI-MGA	<b>Multimedia and Graphics Applications</b> Jiří Chludil, Jan Buriánek, Radek Richtr <b>Radek Richtr</b> Jan Buriánek (Gar.)	Z,ZK	5	2P+2C	Z	v
BI-OOP	<b>Object-Oriented Programming</b> Jan Blizničenko, Filip Kříkava, Robert Pergl, Stéphane Ducasse <b>Robert Pergl</b> Robert Pergl (Gar.)	Z,ZK	4	2P+2C	Z	v
BI-PGR.1	<b>Computer Graphics</b> Petr Felkel <b>Petr Felkel</b> Petr Felkel (Gar.)	Z,ZK	5	2P+2C	L	v
BI-PNO	<b>Practical Digital Design</b> Martin Novotný <b>Martin Novotný</b> Martin Novotný (Gar.)	KZ	5	2P+2C	Z	v
BI-PRP	<b>Law and business</b> Zdeněk Kučera <b>Zdeněk Kučera</b> (Gar.)	Z,ZK	4	2P+1R	L	v
BI-PJP	<b>Programming Languages and Compilers</b> Jan Janoušek <b>Jan Janoušek</b> Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	L	v
BI-PPA	<b>Programming Paradigms</b> Jan Janoušek, Tomáš Pecka, Radomír Polách, Michal Cvach, Petr Máj <b>Radomír Polách</b> Jan Janoušek (Gar.)	Z,ZK	5	2P+2C	Z	v
BI-PGA	<b>Programming of graphic applications</b> Jiří Chludil, Radek Richtr <b>Radek Richtr</b> Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	v
BI-PYT	<b>Python Programming</b> Jiří Znamenáček <b>Michal Valenta</b> Jiří Znamenáček (Gar.)	Z,ZK	4	2P+2C	L	v
BI-SI2.3	<b>Software Engineering 2</b> Martin Hlavatý <b>Tomáš Krátký</b> Martin Hlavatý (Gar.)	Z,ZK	3	2P	Z	v

BI-SP1.1	<b>Team Software Project 1</b>	KZ	5	2C	L	v
BI-SP1	<b>Team Software Project 1</b> <i>Jiří Chludil, Jan Baier, Ondřej Dvořák, Josef Gattermayer, Jiří Hunka, Jan Chrástina, Vojtěch Jirkovský, Stanislav Kuznetsov, Ivo Lašek, ..... Jan Baier Jiří Mlejnek (Gar.)</i>	KZ	4	2C	L	v
BI-SP2.1	<b>Team Software Project 2</b> <i>Jiří Chludil, Jiří Hunka, Jan Chrástina, Stanislav Kuznetsov, Jiří Mlejnek, Robert Pergl, Martin Podloucký, Zdeněk Rybala, Marek Skotnica, ..... Jiří Mlejnek Jiří Mlejnek (Gar.)</i>	KZ	4	2C	Z	v
BI-SP2	<b>Team Software Project 2</b> <i>Jiří Mlejnek</i>	KZ	6	2C	Z	v
BI-SRC	<b>Real-time systems</b> <i>Jaroslav Borecký, Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)</i>	KZ	4	2P+2C	Z	v
BI-TJV	<b>Java Technology</b> <i>Ondřej Guth, Filip Glazar, Josef Pavlíček Ondřej Guth Josef Pavlíček (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-XML	<b>XML Technology</b> <i>Jan Mokry, Miloslav Nič Jan Mokry Miloslav Nič (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-TIS	<b>Information Systems Design</b> <i>Pavel Náplava Michal Valenta Pavel Náplava (Gar.)</i>	Z,ZK	5	2P+1C	Z	v
BI-TUR	<b>User Interface Design</b> <i>Jan Schmidt Tomáš Zahradnický Jan Schmidt (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-TWA.1	<b>Web Application Design</b> <i>David Bernhauer, Petr Klán Tomáš Kadlec Petr Klán (Gar.)</i>	Z,ZK	5	2P+2C	Z	v
BI-VES	<b>Embedded systems</b> <i>Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)</i>	Z,ZK	5	2P+2C	L	v
BI-VWM	<b>Searching the Web and Multimedia Databases</b> <i>Jiří Novák, Tomáš Skopal Michal Valenta Tomáš Skopal (Gar.)</i>	Z,ZK	5	2P+1C	L	v
BI-VZD	<b>Data Mining</b> <i>Karel Klouda, Daniel Vašata Daniel Vašata Pavel Kordík (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-ZRS	<b>Basics of System Control</b> <i>Kateřina Hyniová Kateřina Hyniová Kateřina Hyniová (Gar.)</i>	Z,ZK	4	2P+2C	Z	v
BI-ZUM	<b>Artificial Intelligence Fundamentals</b> <i>Pavel Surynek Tomáš Řehořek Pavel Surynek (Gar.)</i>	Z,ZK	4	2P+2C	L	v
BI-ZNS	<b>Knowledge-based Systems</b> <i>Marcel Jiřina Marcel Jiřina (Gar.)</i>	Z,ZK	5	2P+2C	Z	v

**Characteristics of the courses of this group of Study Plan: Code=BI-BIT-VO.2017 Name=Elective Vocational Courses for a Bachelor Branch BI-BIT, Version 2017**

BI-PRP	Law and business This course is presented in Czech.	Z,ZK	4
BI-AG2	Algorithms and Graphs 2 This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow-up on the introduction given in the compulsory course BI-AG1. It further delves into advanced data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.	Z,ZK	5
BI-PYT	Python Programming The course is taught in Czech.	Z,ZK	4
BI-ZUM	Artificial Intelligence Fundamentals Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well.	Z,ZK	4
BI-ZRS	Basics of System Control Optional subject Basics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the field of automatic control will be definitely evaluated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will teach you description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course in which students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful examples and practical industrial implementations.	Z,ZK	4
BI-BIG	DB Technologies for Big Data This course is presented in Czech.	KZ	4
BI-JPO	Computer Units Students get knowledge of the internal structure and organization of computer or processor components and their interfacing with the environment, the organization of main memory and other internal memories (addressable, LIFO, FIFO, and CAM) and with design methodology for the control unit and controllers, basic principles of communication with peripheral devices and buses.	Z,ZK	5
BI-KOM	Conceptual Modelling This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	5
BI-MGA	Multimedia and Graphics Applications Students gain practical experience with applications for 2D/3D graphics and DTP, as well as with basic methods of creating and editing computer graphics. Students learn theoretical fundamentals of computer graphics. During the semester, students work on various parts of a complex project involving 2D/3D graphics and DTP.	Z,ZK	5
BI-OOP	Object-Oriented Programming Students will learn the pure object-oriented paradigm, being a tool for effective implementation of quality, evolvable business software systems. They will understand fundamentals and they will learn how to apply it for solving typical implementation tasks. Students will learn syntax and programming fundamentals of a pure OO open-source technology Pharo. Various other modern programming languages utilising the OO concepts will be introduced in the subject, as well.	Z,ZK	4

BI-PGR.1	Computer Graphics	Z,ZK	5
Students are able to program a simple interactive 3D graphical application like a computer game or scientific visualisation, to design the scene, add textures imitating geometric details and materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and terms used in computer graphics, such as graphical pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics, and representing solid fundamentals for your professional development, e.g. for GPU programming and animations. They get used to techniques utilised in geometric modelling, modelling of curves and surfaces, and scientific visualisation.			
BI-PNO	Practical Digital Design	KZ	5
Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the basics of the VHDL language, and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the module project using modern, industry-standard CAD design tools.			
BI-PJP	Programming Languages and Compilers	Z,ZK	5
Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implementation of individual compiler parts for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has a certain syntax into a target form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but extends to all other programs for parsing and processing text in a language defined by a LL(1) grammar.			
BI-PPA	Programming Paradigms	Z,ZK	5
This course is presented in Czech.			
BI-PGA	Programming of graphic applications	Z,ZK	5
This course is presented in Czech.			
BI-SI2.3	Software Engineering 2	Z,ZK	3
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-SP1.1	Team Software Project 1	KZ	5
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-SP1	Team Software Project 1	KZ	4
Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided by the BEI-SI1 course that runs concurrently and that teaches the necessary techniques and theory. Teams consisting of 4-6 students will work on a specific project. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) with respect to both the formal and material aspects of the design. The resulting work will be further developed and finished in the BEI-SP2 course.			
BI-SP2.1	Team Software Project 2	KZ	4
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-SP2	Team Software Project 2	KZ	6
Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the BEI-SP1 course project. However, this time, the functionality, testing and documenting of the system being developed will be emphasized. Students will work in teams of 4-6 people. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) with regard to the formal as well as material aspects of their solution. The BEI-SI2 course that runs concurrently will provide the students with supporting knowledge, especially in the area of teamwork, testing and quality assurance of the software product.			
BI-SRC	Real-time systems	KZ	4
Students obtain the basic knowledge in the Real-time theory and in the design methods for RT systems including the dependability issues. Theoretical knowledges from lectures will be experimentally verified on the practical labs of the Department of Digital Design. This subject is mainly based on embedded R-T systems, therefore the used design kits are the same as in BI-VES subject and FPGA.			
BI-TJV	Java Technology	Z,ZK	4
The subject goal is to introduce the programming language Java. The student gains practical experiences for smaller enterprise application programming. This subject presents how to build the three and more layers enterprise systems. The student practically exercises all communication interfaces for each layers (JDBC, RestWeb services, JNDI etc.). At the course end is student able to create three layers enterprise application.			
BI-XML	XML Technology	Z,ZK	4
Students learn to make and validate XML documents (XML Schema, Relax, Schematron) and learn standard methods of their processing (SAX, DOM). An emphasis will be given to language XPath which enables addressing of parts of XML documents and its usage in different XML technologies. Students will also learn basics of XSLT programming. XSLT and XPath programming will be based on version 2.0. Students will gain a broad overview of XML technologies.			
BI-TIS	Information Systems Design	Z,ZK	5
Students know various types of ISs and their practical implementation aspects and are able to match the needs of different market segments (customers) with applications of existing technologies (databases, programming languages, GUI etc.).			
BI-TUR	User Interface Design	Z,ZK	4
Students have a basic overview of the methods for designing and testing common user interfaces. They have experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of the methods that bring users into the development process to ensure optimal communication with a user.			
BI-TWA.1	Web Application Design	Z,ZK	5
The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework AngularJS.			
BI-VES	Embedded systems	Z,ZK	5
Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and embedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.			
BI-VWM	Searching the Web and Multimedia Databases	Z,ZK	5
Students gain basic knowledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogeneous data repository. In particular, the students shall understand the techniques for retrieving text and hypertext documents (the web pages). Moreover, they shall be aware of similarity retrieval methods focused on heterogeneous multimedia databases (unstructured data collections, respectively).			
BI-VZD	Data Mining	Z,ZK	4
Students are introduced to the basic methods of discovering knowledge in data. In particular, they learn the basic techniques of data preprocessing, multidimensional data visualization, statistical techniques of data transformation, and fundamental principles of knowledge discovery methods. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Data mining software is extensively used in the module. Students will be able to apply basic data mining tools to common problems (classification, regression, clustering).			
BI-ZNS	Knowledge-based Systems	Z,ZK	5
This course is presented in Czech.			

## List of courses of this pass:

Code	Name of the course	Completion	Credits
BI-3DT.1	3D Printing	KZ	4
BI-A0L	English Language 0-2	Z	0
BI-A0Z	English Language 0-1	Z	0
BI-A1L	English Language 1-2	Z	0
	This course is opened in every summer semester. It is designed for students attending the bachelor degree programme, whose language knowledge and skills are on a pre-intermediate or intermediate level. Students enroll on this course predominantly in 1st, eventually 2nd or 3rd year of study. The output level of this course corresponds to Level B1 within the Common European Framework of Reference for Languages (CEFR). On completion of this course students are supposed to enroll on the course BI-A2Z in the following winter semester and then on BI-A2L in the following summer semester, followed by a compulsory examination on Level B2 within CEFR. To choose the right course level the student should consider how many semesters he/she needs to prepare for the examination properly. Course objective: The course focuses on practising basic grammar issues (morphology including the entire tense system; basic sentence constructions) and building communicative skills applied to both everyday and professional topics.		
BI-A1Z	English Language 1-1	Z	0
BI-A2L	English Language for IT	Z	2
BI-A2Z	English Language 2-1	Z	0
BI-AAG	Automata and Grammars	Z,ZK	6
	Students are introduced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite automata, regular expressions and regular grammars, translation finite automata, construction and use of pushdown automata, hierarchy of formal languages, Relationships between formal languages and automata. Knowledge acquired through the module is applicable in designs of algorithms for searching in text, data compression, simple parsing and translation, and design of digital circuits.		
BI-ACM	Programming Practices 1 This course is presented in Czech.	KZ	5
BI-ACM2	Programming Practices 2 This course is presented in Czech.	KZ	5
BI-ACM3	Programming Practices 3 This course is presented in Czech.	KZ	5
BI-ACM4	Programming Practices 4 This course is presented in Czech.	KZ	5
BI-ADU.1	Unix Administration This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	5
BI-ADW.1	Windows Administration This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4
BI-AG1	Algorithms and Graphs 1 The course covers the basics from the efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It is interlinked with the concurrent BIE-AAG and BIE-ZDM courses in which the students gain the basic skills and knowledge needed for time and space complexity of algorithms and learn to handle practically the asymptotic mathematics.	Z,ZK	6
BI-AG2	Algorithms and Graphs 2 This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow-up on the introduction given in the compulsory course BI-AG1. It further delves into advanced data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see BIE-AG2.	Z,ZK	5
BI-ALO	Algebra and Logic The course extends and deepens the study of topics touched upon in the basic logic course. Using the unification algorithm and the resolution method we show the link to logic programming. Using set theory, arithmetics, and simple algebraic theories as examples, we present applications of mathematical logic in mathematics and computer science.	Z,ZK	4
BI-AND	Programming for the Android Operating System This course is presented in Czech.	Z,ZK	4
BI-ANG	English Language, Internal Certificate	ZK	2
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-APJ	Application Programming in Java This course is presented in Czech. Advanced technologies in Java.	Z,ZK	4
BI-APS.1	Architectures of Computer Systems Students understand architectures of uniprocessor computers at the level of machine instructions, with emphasis to instruction pipelining and memory hierarchy. They know the main concepts of RISC and CISC architectures. They learn how modern computers work and how they are constructed. They learn about the techniques that today's processors use to increase the program execution speed. They have a basic knowledge allowing them to optimise their programs to fully exploit a given processor architecture. They get an idea about the trends in the area of computer architectures and how they will affect software. They also understand the architectures of vector processors, their use in today's microprocessors. They understand the principles of shared-memory multiprocessor system architectures and the issues of memory consistency.	Z,ZK	5
BI-ARD	Interactive applications on Arduino The subject is designed for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applications for modern programmable kits and control varied peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded systems, i.e. to see the results not only on display of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore is suitable even for Web and Software Engineering students.	KZ	4
BI-ATS	Automated Testing of Software This course is presented in Czech.	Z,ZK	4
BI-BAP	Bachelor Thesis	Z	14

BI-BEK	Secure Code	Z,ZK	5
The students will learn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting familiar with the threat modeling theory, students gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every program needs to run with administrator privileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing data and the relationships of security and database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the defense against them.			
BI-BEZ	Security	Z,ZK	6
Students understand the mathematical fundamentals of cryptography and have an overview of current cryptographic algorithms and applications: symmetric and asymmetric cryptosystems, and hash functions. They also learn the fundamentals of secure programming and IT security, the fundamentals of designing and using modern cryptosystems for computer systems. They are able to use properly and securely cryptographic primitives and systems that are based on these primitives.			
BI-BIG	DB Technologies for Big Data This course is presented in Czech.	KZ	4
BI-BLE	Blender	Z,ZK	4
The course extends knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those interested in 3D graphics and animation. It offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graphics applications) course.			
BI-BPR	Bachelor project This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z	2
BI-CAO	Digital and Analog Circuits	Z,ZK	5
Students get the fundamental understanding of technologies underlying electronic digital systems. They understand the basic theoretical models and principles of functionality of transistors, gates, circuits, and conductors. They are able to design simple circuits and evaluate circuit parameters. They understand the differences between analog and digital modes of electronic devices.			
BI-CS1	Programming in C#	KZ	4
The goal of the course is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental construction, types of variables, operators, arrays, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class definition and class instancing, constructors, methods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging and exception processing, as well as work with files are emphasized.			
BI-CS2	C# language and data access	KZ	4
The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description).			
BI-CS3	Language C# - design of web applications	KZ	4
The students will be introduced to current technologies in web application development on the .NET platform. They will acquire a comprehensive overview of the development possibilities on this platform. They will learn to create WebAPI and to use it by client programs.			
BI-DAN	Taxes for non-Economists	Z,ZK	4
Taxes, including social insurance contributions, are obligatory payments paid by people or institutions to public budgets. This is the way how a significant portion of GDP is redistributed. This course concerns who pays which taxes or who bears the tax burden. The course introduces students to the tax theory and policy fundamentals and shows how they affect taxation of income, consumption, and wealth. The course provides practical information on calculations of tax liabilities of both citizens and institutions as well as information about important taxpayers' formal duties towards public administration.			
BI-DBS	Database Systems	Z,ZK	6
Students are introduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They learn to design small databases (including integrity constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the SQL language, as well as with its theoretical foundation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the fundamental concepts of transaction processing, controlling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced to special ways of storing data in relational databases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of database systems, debugging and optimizing database applications, distributed database systems, data stores.			
BI-DPR	Document., Presentation, Rhetorics	KZ	4
This subject is aimed to the professional communication and writing of the scientific texts (bachelor's and diploma thesis). Students will learn to create and prepare interactive presentations and presenting before an audience. Students will also learn to write technical reports and scientific texts.			
BI-EHA	Ethical Hacking	Z,ZK	5
The course gives a professional and academic introduction to computer and information security using the ethical hacking approach, which enables improved defence thanks to adopting an attacker mindset when discovering vulnerabilities, hands-on experience with different attacks, facilitates linking theory and practice in significant areas of one's digital literacy, and can therefore be utilized by (future) security professionals, (informed) decision-makers, (savvy) users and developers alike. This course is taught in English.			
BI-EHD	Introduction to European Economic History This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	3
BI-EJA	Enterprise Java	Z,ZK	4
The course is on advanced technologies in the Java programming language. The focus is on technologies for development of enterprise information systems which are connected to a database and are accessed through the web interface.			
BI-EMP	Economics and Management Principles	KZ	4
This course is aimed to fundamental problems of business economy. The course makes students familiar with a life cycle of business, specifically with fields: enterprise foundation, enterprise putting into state economic environment (CR), management of property and capital structure, business transaction records keeping during an accounting period, a relation between business production and costs, evaluation of enterprise financial health and business rehabilitation or termination.			
BI-EP1	Effective programming 1 The course is taught in Czech.	Z	4
BI-EP2	Efficient Programming 2	KZ	4
Continuation of Efficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving individual problems are discussed, with the aim to choose the best one and avoid implementation errors.			
BI-FMU	Financial and Management Accounting	Z,ZK	5
The aim of the course is explanation of basic terms in the theory of accounting, the principles of balancing the property amounts and liabilities in the particular accounting operations, operations in accounts and accounting statements including opening and closing of bookkeeping. The course provides students with a legal modification of bookkeeping, description			

of economic operations based on current methods of double-entry bookkeeping for enterprising subjects in the Czech Republic. Principles of management accounting are base of Business Intelligence moduls in Business information systems.				
BI-FTR	Financial Markets	Z,ZK	4	Financial sector has been deeply transformed in the recent years, which led to a development of structured financial products, a new point of view on the issue of credit risk, and globalization of market activities. The need to use and properly apply mathematical and technical tools is emphasized. To manage their financial activities, many firms need graduates from technical schools who have sufficient knowledge ICT and mathematics, and who have at the same time an understanding of the functioning of financial markets. The Financial Markets course thus englobes both a description of financial markets and related economic theories, and an overview of mathematical and statistical tools used in this field.
BI-FTR.1	Financial Markets This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	5	
BI-GIT	Version control system GIT	KZ	2	Students will be introduced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and practically. In this particular system even the implementation details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git server administrators.
BI-HMI	History of Mathematics and Informatics This course is presented in Czech.	Z,ZK	3	
BI-HWB	Hardware Security This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	5	
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad This course is presented in Czech.	KZ	4	
BI-JPO	Computer Units	Z,ZK	5	Students get knowledge of the internal structure and organization of computer or processor components and their interfacing with the environment, the organization of main memory and other internal memories (addressable, LIFO, FIFO, and CAM) and with design methodology for the control unit and controllers, basic principles of communication with peripheral devices and buses.
BI-KOM	Conceptual Modelling This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	5	
BI-KOT	Programing in Kotlin	Z,ZK	4	Kotlin is a modern, statically-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of advanced language constructions. The language is fully Java compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of a modern, object-functional way with minimum of boiler-plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).
BI-LIN	Linear Algebra	Z,ZK	7	The course is taught in Czech. Students understand the theoretical foundation of algebra and mathematical principles of linear models of systems around us, where the dependencies among components are only linear. They know the basic methods for operating with matrices and linear spaces. They are able to perform matrix operations and solve systems of linear equations. They can apply these mathematical principles to solving problems in 2D or 3D analytic geometry. They understand the error-detecting and error-correcting codes.
BI-MEK	Macroeconomic Context of Domestic and World Economy This course is presented in Czech.	Z,ZK	4	
BI-MGA	Multimedia and Graphics Applications	Z,ZK	5	Students gain practical experience with applications for 2D/3D graphics and DTP, as well as with basic methods of creating and editing computer graphics. Students learn theoretical fundamentals of computer graphics. During the semester, students work on various parts of a complex project involving 2D/3D graphics and DTP.
BI-MIK	Fundamentals of Microeconomics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	4	
BI-MLO	Mathematical Logic The course seminary is taught in Czech.	Z,ZK	5	
BI-MMP	Multimedia team project This course is presented in Czech.	KZ	4	
BI-MPP	Methods of interfacing peripheral devices	Z,ZK	4	The course is focused on methods interfacing peripheral devices. Interfacing of real devices is included with stress to Universal serial bus (USB). The course includes either PC side or attached devices. Labs are practically oriented. Students gain gain experience in implementation relevant parts of USB device, Linux and Windows drivers, simple application development, and APIs of selected devices.
BI-OOP	Object-Oriented Programming	Z,ZK	4	Students will learn the pure object-oriented paradigm, being a tool for effective implementation of quality, evolvable business software systems. They will understand fundamentals and they will learn how to apply it for solving typical implementation tasks. Students will learn syntax and programming fundamentals of a pure OO open-source technology Pharo. Various other modern programming languages utilising the OO concepts will be introduced in the subject, as well.
BI-OPT	Introduction to Optical Networks	Z,ZK	4	Students get basic overview of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on possible problems with deployment of optical network technology and on their solutions. The course will include the history of optical communications, an overview of passive components (optical fibres, multiplexors, dispersion compensators, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission systems). The course will also cover the most up-to-date topics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such as the accurate time on Internet, ultrastable frequency transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters. Students will solve real tasks from practice.
BI-OSY	Operating Systems	Z,ZK	5	Students understand the classical theory of operating systems (OS) in addition to the knowledge gained in the BI-UOS module. They get a solid knowledge of OS kernels, processes and threads implementations. They understand the problems of race conditions and principles and algorithms for critical sections, thread scheduling, resource allocation, deadlocks. They understand the techniques of the management of virtual memory, principles and architectures of disks and disk arrays, file systems, and peripheral devices. They gain basic knowledge necessary for developing system applications or for system administration. They are able to design and implement simple multithreaded applications.
BI-PA1	Programming and Algorithmics 1	Z,ZK	6	Students gain the ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, structured, pointers), expressions, statements, functions, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for searching, sorting, and manipulating with linked lists.
BI-PA2	Programming and Algorithmics 2	Z,ZK	7	Students know the instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, queue, enlargeable array, set, table). They can implement linked structures. They learn these skills using the programming language C++. Although this is not a module of programming in C++, students are introduced with all C++ features needed to achieve the main objective (operator overloading, templates).

BI-PAI	Law and Informatics This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	ZK	3
BI-PCS	C# language and data access The C# language and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Microsoft platform. The students will get to know objects used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current technologies such as LINQ - a set of features for querying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (LINQ to Objects, LINQ to XML and LINQ to SQL). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data using domain-specific objects (ORM). This part of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Model, Storage Model and Mapping (XML description).	KZ	4
BI-PGA	Programming of graphic applications This course is presented in Czech.	Z,ZK	5
BI-PGR.1	Computer Graphics Students are able to program a simple interactive 3D graphical application like a computer game or scientific visualisation, to design the scene, add textures imitating geometric details and materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and terms used in computer graphics, such as graphical pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics, and representing solid fundamentals for your professional development, e.g. for GPU programming and animations. They get used to techniques utilised in geometric modelling, modelling of curves and surfaces, and scientific visualisation.	Z,ZK	5
BI-PHP.1	Programming in PHP The course is taught in Czech.. Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices and will use tool that eases development in PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 3rd semester of study.	KZ	4
BI-PJP	Programming Languages and Compilers Students master basic methods of implementation of common high-level programming languages. They get experience with the design and implementation of individual compiler parts for a simple programming language: data types, subroutines, and data abstractions. Students are able to formally specify a translation of a text that has a certain syntax into a target form and write a compiler based on such a specification. The notion of compiler in this context is not limited to compilers of programming languages, but extends to all other programs for parsing and processing text in a language defined by a LL(1) grammar.	Z,ZK	5
BI-PJS	JavaScript Programming This course is presented in Czech.	KZ	4
BI-PJS.1	JavaScript Programming Main goal of the course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development in Javascript. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register for this course in their 4th semester of study.	KZ	4
BI-PJV	Programming in Java The course is taught in Czech.	Z,ZK	4
BI-PKM	Introduction to mathematics This course is presented in Czech.	Z	4
BI-PMA	Programming in Mathematica Students will be working with modern technical and scientific software. Students will learn how to use different programming styles (functional programming, rule-based programming, etc.), how to create dynamic interactive applications and visualisations, data processing and presentations.	Z,ZK	4
BI-PNO	Practical Digital Design Students get an overview of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand the basics of the VHDL language, and implementation technologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the module project using modern, industry-standard CAD design tools.	KZ	5
BI-PPA	Programming Paradigms This course is presented in Czech.	Z,ZK	5
BI-PRP	Law and business This course is presented in Czech.	Z,ZK	4
BI-PRR	Project management This course is presented in Czech.	KZ	4
BI-PS1	Programming in Shell 1 Students become advanced and knowledgeable users of common UNIX-like operating systems. They understand the fundamental principles of the operating systems (file systems, processes and threads, access rights, memory management, network interfaces). They gain the knowledge of advanced users, with hands-on experience of the shell, basic commands, and filters to process various text data.	KZ	5
BI-PS2	Programming in shell 2 Students gain a general overview of available scripting languages, their syntax, semantics, programming style, pros and cons. In addition, they gain a deeper insight into shell and some other particular scripting languages and will get practical experience with shell script programming.	Z,ZK	4
BI-PSI	Computer Networks Students understand the basic common techniques, protocols, technologies, and algorithms necessary to communicate in computer networks. The topics are primarily focused on the 2nd to 4th layer of the ISO OSI model. They also get a basic understanding of communication media, security, and network administration. Students will be able to write a simple network application and configure a simple network.	Z,ZK	5
BI-PST	Probability and Statistics Students are introduced to elements of probability thinking, ability of the synthesis both prior and posterior information and use to work with random variables. They will be able to apply correctly basic models of the distribution of random variables and to solve applied probability problems in the area of informatics and computer science. Using statistical inference methods, they master methods of statistical inference to estimate unknown population parameters on the basis of sample. They get acquainted with basic methods of the determination of possible statistical dependence of two or more random variables.	Z,ZK	5
BI-PYT	Python Programming The course is taught in Czech.	Z,ZK	4
BI-SAP	Computer Structure and Architecture Students understand basic digital computer units and their structures, functions, and hardware implementation: ALU, control unit, memory system, inputs, outputs, data storage and transfer. In the labs, students gain practical experience with the design and implementation of the logic of a simple processor using modern digital design tools. The subject teaches basic knowledge of digital computer construction principles, how a computer performs its operations, what is machine code, and what are its connections to higher programming languages.	Z,ZK	6



BI-SCE1	Computer Engineering Seminar I	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.			
BI-SCE2	Computer Engineering Seminar II	Z	4
The Seminar of Computer Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance to failures and attacks. Students are approached individually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of the subject is work with scientific articles and other professional literature and/or work in KČN laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester.			
BI-SEP	World Economy and Business	Z,ZK	4
This course is presented in Czech. The course introduces students of technical university to the international business. It does that predominantly by comparing individual countries and key regions of world economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as indexes of economic freedom, corruption and economic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discussions based on individual readings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.			
BI-SI1.2	Software Engineering I	Z,ZK	5
Students learn the methods of analysis and design of large software systems, which are typically designed and implemented in teams. They get practical skill thanks to applying hands-on analysis and design of a large-scale software project that is to be developed within the concurrent BI-SP1 module. They get skill to use CASE tools and UML for modelling and solving software-related problems. They get overview of object-oriented analysis, design, architecture, validation, verification, and testing processes.			
BI-SI2.3	Software Engineering 2	Z,ZK	3
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-SM	Shell Minimum	Z	2
This module covers selected elementary programming skills in Bourne Again shell.			
BI-SOJ	Machine Oriented Languages	Z,ZK	4
Students of the course will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal use of microprocessor's features and efficient cooperation of software with hardware. Next, there will be discussed x86 specifics of the majority of Oses from the application point of view linked to higher level languages. This knowledge will be used during reverse engineering, optimization, and evaluation of code security.			
BI-SP1	Team Software Project 1	KZ	4
Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided by the BEI-SI1 course that runs concurrently and that teaches the necessary techniques and theory. Teams consisting of 4-6 students will work on a specific project. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) with respect to both the formal and material aspects of the design. The resulting work will be further developed and finished in the BEI-SP2 course.			
BI-SP1.1	Team Software Project 1	KZ	5
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-SP2	Team Software Project 2	KZ	6
Students gain hands-on experience with the iterative development process while working on a large-scale software project. The first iteration is the result of the BEI-SP1 course project. However, this time, the functionality, testing and documenting of the system being developed will be emphasized. Students will work in teams of 4-6 people. The teacher, in the role of the team and project leader, regularly consults with the team (at the seminars) with regard to the formal as well as material aspects of their solution. The BEI-SI2 course that runs concurrently will provide the students with supporting knowledge, especially in the area of teamwork, testing and quality assurance of the software product.			
BI-SP2.1	Team Software Project 2	KZ	4
This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).			
BI-SQL.1	Language SQL, advanced	KZ	4
Module is based on knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In particular stored program unites, triggers, recursive queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point of view of specialized database structures like indexes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan and possibilities of its. changes will be discussed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle DBMS and partially on PostgreSQL.			
BI-SRC	Real-time systems	KZ	4
Students obtain the basic knowledge in the Real-time theory and in the design methods for RT systems including the dependability issues. Thereticla knowledges from lectures will be experimentally verified on the practical labs of the Department of Digital Design. This subject is mainly based on embedded R-T systems, therefore the used design kits are the same as in BI-VES subject and FPGA.			
BI-SSB	System and Network Security	Z,ZK	5
This course is presented in Czech.			
BI-ST1	Network Technology 1	Z	3
The subject is oriented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is accredited under the Cisco Netacad - CCNA1 - R&S Introduction to Networks.			
BI-ST2	Network Technology 2	Z	3
This course is presented in Czech.			
BI-ST3	Network Technology 3	Z	3
Students will further enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses will get further extended in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc.			
BI-ST4	Network Technology 4	Z	3
Students will further enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching presented during BI-ST1 and BI-ST2 courses got further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predictability, extension beyond a simple topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely other type of network (Non Broadcast Multiple Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch firmware, perform password recoveries, and emergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigation ways while maintaining the network running.			
BI-STO	Storage and Filesystems	Z,ZK	4
The student will learn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archiving, as so as storage scaling, load balancing and high availability.			

BI-SVZ	Computer Vision and Image Processing	Z,ZK	5
Camera systems become a common part of life by being universally available. This phenomenon also relates to the need to process and evaluate image information. The subject acquaints students with different types of camera systems and with a variety of image and video processing methods. The course is focused on the use of camera systems for solving practical problems, which students can meet in a real life.			
BI-TDA	Test driven architecture	KZ	4
The course is focused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that are well known in the DevOps world. This course has a strong connection on courses like BI(E)-SI1 and BI(E)-SI2. The main goal of this course is to learn by examples that occur in the semester project.			
BI-TEX	TeX and Typography	Z,ZK	4
This course is presented in Czech.			
BI-TIS	Information Systems Design	Z,ZK	5
Students know various types of ISs and their practical implementation aspects and are able to match the needs of different market segments (customers) with applications of existing technologies (databases, programming languages, GUI etc.).			
BI-TJV	Java Technology	Z,ZK	4
The subject goal is to introduce the programming language Java. The student gains practical experiences for smaller enterprise application programming. This subject presents how to build the three and more layers enterprise systems. The student practically exercises all communication interfaces for each layers (JDBC, RestWeb services, JNDI etc.). At the course end is student able to create three layers enterprise application.			
BI-TS1	Theoretical Seminar I	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.			
BI-TS2	Theoretical Seminar II	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.			
BI-TS3	Theoretical Seminar III	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.			
BI-TS4	Theoretical Seminar IV	Z	4
Theoretical seminar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classical reading group. The students are treated individually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a work with scientific papers and other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.			
BI-TUR	User Interface Design	Z,ZK	4
Students have a basic overview of the methods for designing and testing common user interfaces. They have experience to solve the problems where software and other products do not communicate with the user optimally, since the needs and characteristics of users are not taken into account during product development. Students gain an overview of the methods that bring users into the development process to ensure optimal communication with a user.			
BI-TWA.1	Web Application Design	Z,ZK	5
The basic course of web application development. Initially, the students become familiar with HTTP and its possibilities and partly with some properties of language describing the structure (HTML) and presentation of document on the Web (CSS). These skills provide the necessary basis for the development of Web applications, which will be demonstrated in modern libraries facilitate the development of Web pages applications. Server side will be demonstrated on PHP technology using frameworks Symfony 2, Doctrine 2. Developments on the client side will be demonstrated using a JavaScript language with library jQuery and possibly MV* framework AngularJS.			
BI-UDZ	Introduction to Audio Digitization	ZK	2
Students will learn how we understand sound from a physical perspective. Next they will familiarize with audio conversion from its physical representation into analog, and later by sampling, into a digital form. Students will have a possibility to gain insight at how the subsequent audio processing works by means of audio filtration and effects, and will learn which file formats are used in both uncompressed (WAV) and compressed audio such as MPEG Audio Layer 3 work. Later in the course, students will familiarize with speech synthesis and speech-to-text recognition. A practical aspects of sound identification, such as during investigation and forensics, will also be discussed. The final lecture will be dedicated to the world of music.			
BI-ULI	Introduction to Linux	Z	2
Students become familiar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become familiar with basic commands and techniques of a Unix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).			
BI-VES	Embedded systems	Z,ZK	5
Students learn to design embedded systems and develop software for them. They get basic knowledge of the most common microcontrollers and mebedded processors, their integrated peripheral circuits, programming methods, and applications. They get practical skills with development kits and tools.			
BI-VHS	Virtual game-worlds	ZK	4
The course leads students to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,...). This current students knowledge is furthermore complemented by the theory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world. The course can be followed by the course MI-PVR with the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.			
BI-VMM	Selected Mathematical Methods	Z,ZK	4
We start reviewing geometric properties of linear spaces with inner product. Next, we introduce and analyze the discrete Fourier transform (DFT) and its fast implementation (FFT). Further we deal with differential calculus of functions involving multiple variables. We present methods for the localization of extreme values of functions. For this purposes, we study normed linear spaces and quadratic forms. In addition, we introduce the least square method. The last part of the course is devoted to optimization and duality. The linear programming and the Simplex method is analyzed in more detail.			
BI-VR1	Virtual reality I	KZ	4
Introduction to Virtual Reality (VR), virtual reality operating system and virtual reality creation. Another objective is to meet the rules and requirements of virtual worlds communication. The course focuses on the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds and improves computational thinking and shared social activities.			
BI-VWM	Searching the Web and Multimedia Databases	Z,ZK	5
Students gain basic knowledge concerning retrieval techniques on the web, where the web environment is viewed as a large distributed and heterogenous data repository. In particular, the students shall understand the techniques for retrieving text and hypertext documents (the web pages). Moreover, they shall be aware of similarity retrieval methods focused on heterogenous multimedia databases (unstructured data collections, respectively).			

BI-VZD	Data Mining	Z,ZK	4
Students are introduced to the basic methods of discovering knowledge in data. In particular, they learn the basic techniques of data preprocessing, multidimensional data visualization, statistical techniques of data transformation, and fundamental principles of knowledge discovery methods. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Data mining software is extensively used in the module. Students will be able to apply basic data mining tools to common problems (classification, regression, clustering).			
BI-XML	XML Technology	Z,ZK	4
Students learn to make and validate XML documents (XML Schema, Relax, Schematron) and learn standard methods of their processing (SAX, DOM). An emphasis will be given to language XPath which enables addressing of parts of XML documents and its usage in different XML technologies. Students will also learn basics of XSLT programming. XSLT and XPath programming will be based on version 2.0. Students will gain a broad overview of XML technologies.			
BI-ZDM	Elements of Discrete Mathematics	Z,ZK	5
Students get both a mathematical sound background, but also practical calculation skills in the area of combinatorics, value estimation and formula approximation, tools for solving recurrent equations, and basics of graph theory.			
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
Intelligent embedded system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the course is to teach students modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control, sensor reading, application interfaces, robot navigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get practical experience with these technologies.			
BI-ZMA	Elements of Calculus	Z,ZK	6
Students acquire knowledge and understanding of the fundamentals of classical calculus so that they are able to apply mathematical way of thinking and reasoning and are able to use basic proof techniques. They get skills to practically handle functions of one variable in solving the problems in informatics. They understand the links between the integrals and sums of sequences. They are able to estimate lower or upper bounds of values of real functions and to handle simple asymptotic expressions.			
BI-ZNF	PHP Framework Nette - basics	KZ	3
Students will gain the basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech popular framework. The resulting knowledge should serve for the efficient creation of a web backend in PHP language.			
BI-ZNS	Knowledge-based Systems	Z,ZK	5
This course is presented in Czech.			
BI-ZPI	Process engineering	KZ	4
Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of process modelling and they will learn basics of the used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of business processes using modern CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information and business strategy of an enterprise.			
BI-ZRS	Basics of System Control	Z,ZK	4
Optional subject Basics of System Control is designed for anyone interested in applied computer science in bachelor studies. A brief introduction to the field of automatic control will be definitely evaluated by our graduates in the industrial practice. Students will gain knowledge in this rapidly evolving field of great future. We will focus our attention particularly on control of engineering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems. We will teach you description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD and fuzzy controllers. This is a survey course in which students will learn the methods of creating a description of the system model, the basic linear dynamic systems analysis and design verification and simple PID feedback, PSD and fuzzy controllers. Attention is also given to sensors and actuators in control loops, issues of stability in control systems, single and continuous adjustment of the controller parameters and certain aspects of the industrial implementation of continuous and digital controllers and PLC control. The themes of lectures are accompanied by a number of useful examples and practical industrial implementations.			
BI-ZS10	Bachelor internship abroad for 10 credits	Z	10
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.			
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.			
BI-ZS30	Bachelor internship abroad for 30 credits	Z	30
Each student can once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or research institution. Before the internship the Dean of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professional content and extent of the internship. Auxiliary courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits correspond to 4 weeks of full-time employment with a foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into two subjects if the internship exceeds the academic year's dead-line.			
BI-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well.			
BI-ZWU	Introduction to Web and User Interfaces	Z,ZK	4
This course is presented in Czech.			
BIE-IMA2	Introduction to Mathematics 2	Z	2
Students refresh and extend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are able to apply them in particular examples.			
BIE-ZUM	Artificial Intelligence Fundamentals	Z,ZK	4
Students are introduced to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical tasks from the areas of state space search, multi-agent systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms and the neural networks, will be presented as well.			

FI-FIL	Philosophy see A0B16	ZK	2
FI-GNO	Introduction to Gnoseology Předmět studenty uvádí do teorie poznání, systémovým pohledem nahlíží na pole kultury, na vztahy a rozdíly mezi přírodními a humánními obory, vědou a uměním. Rozborem dějin modernismu a myšlenkových proudů 20. století jsou ukázány proměny paradigmat a převrat k postmodernismu, analýzou paralelismů ve vědě a umění odhaleny mechanismy tvůrčích procesů. V návaznosti na teorii přírodních jazyků a sémiotiky je vedena diskuze i o kognitivních procesech, v historickém přehledu nastíněna hlediska estetického vnímání. Samostatnou kapitolou jsou modely spojených přírodních soustav a systémů, v závěru přednášek je pozornost věnována filozofii vědy a otázkám udržitelného rozvoje. Předmět přednáší a garantuje Ing. Ivo Janoušek CSc.	ZK	2
FI-HPZ	Humanities subject from a study abroad A "Humanities subject that has been studied abroad" is covered by the Humanities subject from a study abroad in Compulsory Humanities Module that is required in the curriculum. The substitution is approved by the Vice-Dean for study affairs on behalf of the Dean at the request of the student.	Z	3
FI-HTE	History of Technology and Economics The course introduces the scientific disciplines of history and technology, economic and social history of the Czech lands and Czechoslovakia in comparison with the development of the European region 19 to 21 century.	ZK	2
FI-KSA	Cultural and Social Anthropology The one-semester course aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diversity of the world - examples from anthropological research from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, material culture, language, health, history, death, etc ...) will be shown. The course is an interesting alternative to other humanities, taught at FIT.	ZK	2
FI-MPL	Managerial Psychology	ZK	2
FI-ULI	Introduction to Linguistics for Computer This course is presented in Czech.	ZK	2
MI-GLR	Games and reinforcement learning The field of reinforcement learning is very hot recently, because of advances in deep learning, recurrent neural networks and general artificial intelligence. This course is intended to give you both theoretical and practical background so you can participate in related research activities. Presented in English.	Z,ZK	4
TV1	Physical Education	Z	0
TV2	Physical Education	Z	0
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/FF.html>

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