

## Recommended pass through the study plan

### Name of the pass: Bachelor Branch WSI, Specialization Computer Graphics, in Czech, Version 2015-2020

Faculty/Institute/Others:

Department: Department of Software Engineering

Pass through the study plan: Bachelor Branch WSI, Specialization Computer Graphics, in Czech, Version 2015 to 2020

Branch of study guaranteed by the department: Web and Software Engineering

Guarantor of the study branch: prof. Dr. Ing. Petr Kroha, CSc.

Program of study: Informatics (in Czech)

Type of study: Bachelor full-time

Note on the pass: Předmět EMP je ekvivalentní staršímu předmětu EPD. Platí obousměrná zastupitelnost.

Oba předměty lze zapsat dohromady nejvýše dvakrát.

Coding of roles of courses and groups of courses:

P - compulsory courses of the program, PO - compulsory courses of the branch, Z - compulsory courses, S - compulsory elective courses, PV - compulsory elective courses, F - elective specialized courses, V - elective courses, T - physical training courses

Coding of ways of completion of courses (KZ/Z/ZK) and coding of semesters (Z/L):

KZ - graded assesment, Z - assesment, ZK - examination, L - summer semester, Z - winter semester

Number of semester: 1

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-MLO	<b>Mathematical Logic</b> Jan Starý, Kateřina Trlířajová Jan Starý Kateřina Trlířajová (Gar.)	Z,ZK	5	2P+1C	Z	PP
BI-PA1	<b>Programming and Algorithmics 1</b> Miroslav Balík, Josef Vogel, Ladislav Vagner Ladislav Vagner (Gar.)	Z,ZK	6	2P+2R+2C	Z	PP
BI-PS1	<b>Programming in Shell 1</b> Jiří Kašpar, Jan Trdlička, Zdeněk Muzikář, Yelena Trofimova, Lukáš Bařinka, Michal Soch, Dana Čermáková, Viktor Černý, Jakub Žitný Dana Čermáková Zdeněk Muzikář (Gar.)	KZ	5	2P+2C	Z	PP
BI-PAI	<b>Law and Informatics</b> Matěj Myška, Alžběta Krausová, Michal Matějka, Zdeněk Kučera Zdeněk Kučera (Gar.)	ZK	3	2P	Z	PP
BI-ZMA	<b>Elements of Calculus</b> Ivo Petr, Tomáš Kalvoda, Pavel Hrabák Jitka Hrabáková Tomáš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP
BI-CAO	<b>Digital and Analog Circuits</b> Jan Řezníček, Martin Novotný, Martin Kohlík, Pavel Kubalík, Jaroslav Borecký, Vojtěch Miškovský Martin Kohlík Martin Novotný (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-PT.2015	<b>Povinná tělesná výchova bakalářského programu Informatika, verze 2015</b> TV1,TVV,..... (see the list of groups below)	Min. cours. 2	Min/Max 0/			PT

Number of semester: 2

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-DBS	<b>Database Systems</b> Jan Matoušek, David Šenkýř, Jiří Hunka, Michal Valenta, Marek Erben, Karel Quast, Cyril Černý, Oldřich Malec, Filip Glazar, ..... Antonín Procházka Michal Valenta (Gar.)	Z,ZK	6	2P+2R+1L	Z,L	PP
BI-LIN	<b>Linear Algebra</b> Luděk Kleprlík, Daniel Dombek Daniel Dombek Daniel Dombek (Gar.)	Z,ZK	7	4P+2C	L	PP
BI-PA2	<b>Programming and Algorithmics 2</b> Josef Vogel, Jiří Kašpar, Jan Matoušek, Adam Jirovský, Šimon Schierreich, David Šenkýř, Radek Richtr, Ladislav Vagner, Roman Jelínek, ..... Ladislav Vagner Ladislav Vagner (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
BI-SAP	<b>Computer Structure and Architecture</b> Martin Novotný, Hana Kubátová, Petr Fišer Hana Kubátová Hana Kubátová (Gar.)	Z,ZK	6	2P+1R+2C	L	PP

BI-PT.2015	<b>Povinná tělesná výchova bakalářského programu Informatika, verze 2015</b> <i>TV1,TVV,..... (see the list of groups below)</i>	Min. cours. 2	Min/Max 0/			PT
BI-V.2017	<b>Čistě volitelné předměty bakalářského programu BI, verze 2017</b> <i>BI-3DT.1,BI-ALO,..... (see the list of groups below)</i>	Min. cours. 0	Min/Max 0/			V

Number of semester: 3

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-AG1	<b>Algorithms and Graphs 1</b> <i>Jiřina Scholtzová, Tomáš Valla, Ondřej Suchý, Pavel Tvrdlík, Dušan Knop Pavel Tvrdlík Pavel Tvrdlík (Gar.)</i>	Z,ZK	6	2P+2C	Z	PP
BI-AAG	<b>Automata and Grammars</b> <i>Jan Janoušek, Jan Holub, Martin Svoboda, Radomír Polách, Ondřej Guth Jan Janoušek Jan Holub (Gar.)</i>	Z,ZK	6	2P+2C	Z	PP
BI-ZDM	<b>Elements of Discrete Mathematics</b> <i>Daniel Dombek, Petr Matyáš, Jiřina Scholtzová, Josef Kolář Daniel Dombek Josef Kolář (Gar.)</i>	Z,ZK	5	2P+2C	Z	PP
BI-MGA	<b>Multimedia and Graphics Applications</b> <i>Jiří Chludil, Jan Buriánek Radek Richtr Jan Buriánek (Gar.)</i>	Z,ZK	5	2P+2C	Z	PZ
BI-PYT	<b>Python Programming</b> <i>Jiří Znamenáček, Tomáš Kosek, Pavlína Nováková, Tomáš Šabata, Jakub Švehla, Markéta Jůzlová, Radim Slovák, Michal Němec, Tíbor Szolár, ..... Michal Valenta Markéta Jůzlová (Gar.)</i>	Z,ZK	4	2P+2C	L	PZ
BI-V.2017	<b>Čistě volitelné předměty bakalářského programu BI, verze 2017</b> <i>BI-3DT.1,BI-ALO,..... (see the list of groups below)</i>	Min. cours. 0	Min/Max 0/			V

Number of semester: 4

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-BEZ	<b>Security</b> <i>Martin Jelínek, Jiří Dostál, Róbert Lórencz, Jiří Buček, Jiří Smítka, Tomáš Zahradnický, Filip Kodýtek, Martin Jureček Daniel Kobrle Róbert Lórencz (Gar.)</i>	Z,ZK	6	2P+2C	L	PP
BI-OSY	<b>Operating Systems</b> <i>Jiří Kašpar, Ladislav Vagner, Jan Trdlička, Michal Šoch, Michal Štepanovský Jiří Kašpar Jan Trdlička (Gar.)</i>	Z,ZK	5	2P+1R+1L	L	PP
BI-PSI	<b>Computer Networks</b> <i>Yelena Trofimova, Dana Čermáková, Viktor Černý, Pavel Kubalík, Vojtěch Pail, Jan Fesl, Vladimír Smotlacha Tomáš Herout Jan Fesl (Gar.)</i>	Z,ZK	5	2P+1R+1C	L	PP
BI-SI1.2	<b>Software Engineering I</b> <i>Marek Suchánek, Jiří Mlejnek, Petr Kroha, Zdeněk Rybola, Stanislav Kuznetsov, Marek Skotnica Jiří Mlejnek Jiří Mlejnek (Gar.)</i>	Z,ZK	5	2P+1C	Z,L	PP
BI-PGR.1	<b>Computer Graphics</b> <i>Petr Felkel Petr Felkel Petr Felkel (Gar.)</i>	Z,ZK	5	2P+2C	L	PZ
BI-TUR	<b>User Interface Design</b> <i>Jan Schmidt Tomáš Zahradnický Jan Schmidt (Gar.)</i>	Z,ZK	4	2P+2C	L	PZ

Number of semester: 5

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-BPR	<b>Bachelor project</b> <i>Zdeněk Muzikář Miroslav Balík Zdeněk Muzikář (Gar.)</i>	Z	2		Z,L	PP
BI-PST	<b>Probability and Statistics</b> <i>Pavel Hrabák, Daniel Vašata, Petr Novák Pavel Hrabák Petr Novák (Gar.)</i>	Z,ZK	5	2P+1R+1C	Z	PP
BI-PGA	<b>Programming of graphic applications</b> <i>Radek Richtr, Jiří Chludil Radek Richtr Radek Richtr (Gar.)</i>	Z,ZK	5	2P+2C	Z	PZ
BI-SP2.1	<b>Team Software Project 2</b> <i>Jiří Hunka, Jiří Chludil, Robert Pergl, Marek Suchánek, Jiří Mlejnek, Zdeněk Rybola, Jan Chrastina, Petr Špaček, Stanislav Kuznetsov, ..... Jiří Mlejnek Jiří Mlejnek (Gar.)</i>	KZ	4	2C	Z	PZ
BI-EMP	<b>Economics and Management Principles</b> <i>David Buchtela, Petra Pavlíčková, Pavla Vozárová David Buchtela David Buchtela (Gar.)</i>	KZ	4	2P+2C	Z,L	PE

BI-V.2017	<b>Čistě volitelné předměty bakalářského programu BI, verze 2017</b> <i>BI-3DT.1, BI-ALO,..... (see the list of groups below)</i>	Min. cours. 0	Min/Max 0/			V
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Number of semester: 6

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-BAP	<b>Bachelor Thesis</b> <i>Miroslav Balík Zdeněk Muzikář (Gar.)</i>	Z	14		L,Z	PP
BI-DPR	<b>Document., Presentation, Rhetorics</b> <i>Eliška Šestáková, Ondřej Guth, Petra Pavličková, Dana Vyníkarová, Alena Libánská Ondřej Guth Dana Vyníkarová (Gar.)</i>	KZ	4	2P+2C	Z,L	PP
BI-PV-EM.2015	<b>Povinně volitelné ekonomicko manažerské předměty bc. programu Informatika, ver. 2015</b> <i>BI-DAN, FI-VEZ,..... (see the list of groups below)</i>	Min. cours. 1 Max. cours. 3	Min/Max 4/12			VE
BI-ZKA	<b>Zkouška z angličtiny interní</b> <i>BI-AZKE, BI-ANG1,..... (see the list of groups below)</i>	Min. cours. 1 Max. cours. 1	Min/Max 2/2			PJ
BI-PV-HU.2015	<b>Povinně volitelné humanitní předměty bakalářského programu Informatika, verze 2015</b> <i>FI-FIL, BI-HMI,..... (see the list of groups below)</i>	Min. cours. 1	Min/Max 2/6			VH
BI-V.2017	<b>Čistě volitelné předměty bakalářského programu BI, verze 2017</b> <i>BI-3DT.1, BI-ALO,..... (see the list of groups below)</i>	Min. cours. 0	Min/Max 0/			V

### List of groups of courses of this pass with the complete content of members of individual groups

Kód	Name of the group of courses and codes of members of this group (for specification see here or below the list of courses)	Completion	Credits	Scope	Semester	Role
<b>BI-PT.2015</b>	<b>Povinná tělesná výchova bakalářského programu Informatika, verze 2015</b>	Min. cours. 2	Min/Max 0/			PT
TV1	Physical Education	TVV	Physical education	TVV0	Physical education	
TV2	Physical Education	TVKLV	Physical Education Course	TVKZV	Physical Education Course	
<b>BI-PV-EM.2015</b>	<b>Povinně volitelné ekonomicko manažerské předměty bc. programu Informatika, ver. 2015</b>	Min. cours. 1 Max. cours. 3	Min/Max 4/12			VE
BI-DAN	Taxes for non-Economists	FI-VEZ	economic-managerial course from ...	BI-FTR.1	Financial Markets	
BI-MEK	Macroeconomic Context of Domesti ...	BI-PRR	Project management	BI-PRP	Law and business	
BI-SEP	World Economy and Business	BI-MIK	Fundamentals of Microeconomics			
<b>BI-PV-HU.2015</b>	<b>Povinně volitelné humanitní předměty bakalářského programu Informatika, verze 2015</b>	Min. cours. 1	Min/Max 2/6			VH
FI-FIL	Philosophy	BI-HMI	History of Mathematics and Infor ...	FI-HTE	History of Technology and Econom ...	
FI-HPZ	Humanities subject from a study ...	FI-MPL	Managerial Psychology	FI-GNO	Introduction to Gnoseology	
BI-EHD	Introduction to European Economi ...	FI-KSA	Cultural and Social Anthropology	BI-KSA	Cultural and Social Anthropology	
FI-ULI	Introduction to Linguistics for ...					
<b>BI-V.2017</b>	<b>Čistě volitelné předměty bakalářského programu BI, verze 2017</b>	Min. cours. 0	Min/Max 0/			V
BI-3DT.1	3D Printing	BI-ALO	Algebra and Logic	BI-AOZ	English Language 0-1	
BI-A0L	English Language 0-2	BI-A1Z	English Language 1-1	BI-A1L	English Language 1-2	
BI-A2Z	English Language 2-1	BI-A2L	English Language for IT	BI-APJ	Application Programming in Java	
MI-AFP	Applied Functional Programming	BIE-ZUM	Artificial Intelligence Fundamen ...	BI-ATS	Automated Testing of Software	
BI-BLE	Blender	MI-DSP	Database Systems in Practes	BI-STO	Storage and Filesystems	
MI-DZO	Digital Image Processing	NI-DZO	Digital Image Processing	NI-DDM	Distributed Data Mining	
MI-DDM	Distributed Data Mining	BI-EP1	Effective programming 1	BI-EP2	Efficient Programming 2	
BI-EJA	Enterprise Java	BI-EHA	Ethical Hacking	BI-FMU	Financial and Management Account ...	
BI-HMI	History of Mathematics and Infor ...	BI-ARD	Interactive applications on Ardu ...	NI-IAM	Internet and Multimedia	
BIE-IMA2	Introduction to Mathematics 2	BI-CS2	C# language and data access	BI-PCS	C# language and data access	
BI-CS3	Language C# - design of web appl ...	BI-SQL.1	Language SQL, advanced	NI-LSM	Statistical Modelling Lab	

NI-MPL	Managerial Psychology	NI-MSI	Mathematical Structures in Compu ...	MI-MSI	Mathematical Structures in Compu ...
BI-MPP	Methods of interfacing periphera ...	NI-MOP	Modern Object-Oriented Programmi ...	BI-MMP	Multimedia team project
NI-OLI	Linux Drivers	MI-OLI	Linux Drivers	BI-ACM	Programming Practices 1
BI-ACM2	Programming Practices 2	BI-ACM3	Programming Practices 3	BI-ACM4	Programming Practices 4
BI-AND	Programming for the Android Oper ...	BI-CS1	Programming in C#	BI-PJV	Programming in Java
BI-PMA	Programming in Mathematica	BI-PHP.1	Programing in PHP	BI-PJS.1	JavaScript Programming
BI-KOT	Programing in Kotlin	MI-PSL	Programing in Scala	MI-PDD.16	Data Preprocessing
NI-PDD	Data Preprocessing	BI-PKM	Introduction to mathematics	NI-REV	Reverse Engineering
MI-REV.16	Reverse Engineering	BI-SCE1	Computer Engineering Seminar I	BI-SCE2	Computer Engineering Seminar II
BI-SVZ	Machine vision and image process ...	BI-SOJ	Machine Oriented Languages	MI-SYP.16	Parsing and Compilers
NI-SYP	Parsing and Compilers	BI-GIT	Version control system GIT	BI-ST1	Network Technology 1
BI-ST2	Network Technology 2	BI-ST3	Network Technology 3	BI-ST4	Network Technology 4
BI-TS1	Theoretical Seminar I	BI-TS2	Theoretical Seminar II	BI-TS3	Theoretical Seminar III
BI-TS4	Theoretical Seminar IV	BI-TDA	Test driven architecture	NI-TSP	Testing and Reliability
MI-TSP.16	Testing and Reliability	BI-TEX	TeX and Typography	NI-VCC	Virtualization and Cloud Computi ...
BI-VHS	Virtual game-worlds	BI-VR1	Virtual reality I	BI-VMM	Selected Mathematical Methods
MI-VYC	Computability	NI-VYC	Computability	BI-ZS10	Bachelor internship abroad for 1 ...
BI-ZS20	Bachelor internship abroad for 2 ...	BI-ZS30	Bachelor internship abroad for 3 ...	BI-ZIVS	Intelligent Embedded System Fund ...
BI-ZPI	Process engineering	BI-ZNF	PHP Framework Nette - basics	BI-IOS	Fundamentals of iOS Application ...
BI-ZWU	Introduction to Web and User Int ...	BI-ZRS	Basics of System Control	BI-ULI	Introduction to Linux
BI-UDZ	Introduction to Audio Digitizati ...	BI-OPT	Introduction to Optical Networks		

<b>BI-ZKA</b>	<b>Zkouška z angličtiny interní</b>			<b>Min. cours.</b> <b>1</b>	<b>Min/Max</b> <b>2/2</b>		<b>PJ</b>
BI-AZKE	English, an External Exam	BI-ANG1	English Language Examination wit ...	BI-ANG	English Language, Internal Certi ...		

### 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
Requirements for course credit. Academic Achievement - students are due to: -Take an active part in the language instruction. -Meet the requirements for writing assignments - Summary, Abstract, Argumentation Paper. -Succeed in both the midterm and the final term tests with the success rate set at 70%. -80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by individual teachers during the first class of the term.			
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-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-ALO	<b>Algebra and Logic</b> The course extends and deepens the study of topics touched upon in the basic course in logic.	Z,ZK	4
BI-AND	<b>Programming for the Android Operating System</b> This course is presented in Czech.	Z,ZK	4
BI-ANG	<b>English Language, Internal Certificate</b>	ZK	2
BI-ANG1	<b>English Language Examination without Preparatory Courses</b>	Z,ZK	2
BI-APJ	<b>Application Programming in Java</b> This course is presented in Czech. Advanced technologies in Java.	Z,ZK	4
BI-ARD	<b>Interactive applications on Arduino</b> 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	<b>Automated Testing of Software</b> This course is presented in Czech.	Z,ZK	4
BI-AZKE	<b>English, an External Exam</b>	ZK	2
BI-BAP	<b>Bachelor Thesis</b>	Z	14
BI-BEZ	<b>Security</b> 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.	Z,ZK	6
BI-BLE	<b>Blender</b> 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.	Z,ZK	4
BI-BPR	<b>Bachelor project</b>	Z	2
BI-CAO	<b>Digital and Analog Circuits</b> 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.	Z,ZK	5
BI-CS1	<b>Programming in C#</b> 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.	KZ	4
BI-CS2	<b>C# language and data access</b> 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	<b>Language C# - design of web applications</b> 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-DAN	<b>Taxes for non-Economists</b> 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-DBS	<b>Database Systems</b> 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.	Z,ZK	6
BI-DPR	<b>Document., Presentation, Rhetorics</b> 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.	KZ	4
BI-EHA	<b>Ethical Hacking</b> 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-EHD	<b>Introduction to European Economic History</b> This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).	Z,ZK	3
BI-EJA	<b>Enterprise Java</b> 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-EMP	Economics and Management Principles 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.	KZ	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-FMU	Financial and Management Accounting 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.	Z,ZK	5
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 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-HMI	History of Mathematics and Informatics This course is presented in Czech.	Z,ZK	3
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad This course is presented in Czech.	KZ	4
BI-KOT	Programing in Kotlin 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).	Z,ZK	4
BI-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 presented in Czech.	ZK	2
BI-LIN	Linear Algebra 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.	Z,ZK	7
BI-MEK	Macroeconomic Context of Domestic and World Economy This course is presented in Czech.	Z,ZK	4
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-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 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.	Z,ZK	4
BI-OPT	Introduction to Optical Networks Students get basic overview of optical networking technology with the emphasis on practical utiilization 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.	Z,ZK	4
BI-OSY	Operating Systems Students understand the classical theory of operating systems (OS) in addition to the knowledge gained in the module "Programming in Shell 1". They get a solid knowledge of OS kernels, processes and threads implementations. They understand the problems of race conditions, thread scheduling, resource allocation and deadlocks, the techniques of the management of virtual memory, principles and architectures of disks, RAID and file systems. They are able to design and implement simple multithreaded applications.	Z,ZK	5
BI-PA1	Programming and Algorithmics 1 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.	Z,ZK	6
BI-PA2	Programming and Algorithmics 2 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).	Z,ZK	7
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	<b>C# language and data access</b>	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-PGA	<b>Programming of graphic applications</b> This course is presented in Czech.	Z,ZK	5
BI-PGR.1	<b>Computer Graphics</b>	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-PHP.1	<b>Programming in PHP</b>	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-PJS.1	<b>JavaScript Programming</b>	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-PJV	<b>Programming in Java</b> The course is taught in Czech.	Z,ZK	4
BI-PKM	<b>Introduction to mathematics</b> This course is presented in Czech.	Z	4
BI-PMA	<b>Programming in Mathematica</b>	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-PRP	<b>Law and business</b> This course is presented in Czech.	Z,ZK	4
BI-PRR	<b>Project management</b> This course is presented in Czech.	KZ	4
BI-PS1	<b>Programming in Shell 1</b>	KZ	5
Students become 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-PSI	<b>Computer Networks</b>	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	<b>Probability and Statistics</b>	Z,ZK	5
The students will learn the basics of probabilistic thinking, the ability to synthesize prior and posterior information and learn to work with random variables. They will be able to apply basic models of random variable distributions and solve applied probabilistic problems in informatics and computer science. Using the statistical induction they will be able to perform estimations of unknown distributional parameters from random sample characteristics. They will also be introduced to the methods of determining the statistical dependence of two or more random variables.			
BI-PYT	<b>Python Programming</b> The course is taught in Czech.	Z,ZK	4
BI-SAP	<b>Computer Structure and Architecture</b>	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-SCE1	<b>Computer Engineering Seminar I</b>	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	<b>Computer Engineering Seminar II</b>	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	<b>World Economy and Business</b>	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	<b>Software Engineering I</b>	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-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-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-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	Machine vision and image processing	Z,ZK	5
Camera systems are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate image information. The course introduces students to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use of camera systems for solving problems of practice that the graduates may encounter.			
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-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-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-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-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-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-ZWU	Introduction to Web and User Interfaces This course is presented in Czech.	Z,ZK	4
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	ZK	2
Předmět studenty uvádí do teorie poznání, systémovým pohledem nahlíží na pole kultury, na vztahy a rozdíly mezi přírodními a humánními obory, vědou a uměním. Rozbořením 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.			
FI-HPZ	Humanities subject from a study abroad	Z	3
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.			
FI-HTE	History of Technology and Economics	ZK	2
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.			
FI-KSA	Cultural and Social Anthropology	ZK	2
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.			
FI-MPL	Managerial Psychology	ZK	2
FI-ULI	Introduction to Linguistics for Computer	ZK	2
This course is presented in Czech.			
FI-VEZ	economic-managerial course from a study abroad	Z	4
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.			
MI-AFP	Applied Functional Programming	KZ	5
This course is presented in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional programming languages are on the rise nowadays and the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, mastering this paradigm becomes a necessary competence of a software engineer: the theory and especially the practice.			
MI-DDM	Distributed Data Mining	KZ	4
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands on experience with large scale data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations and will be capable to propose approaches to parallelize other algorithms. The course is presented in czech language.			
MI-DSP	Database Systems in Practes	Z,ZK	4
This course is presented in Czech.			
MI-DZO	Digital Image Processing	Z,ZK	4
This course presents a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algorithms that are both easy to implement and have an interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also valuable outside the domain of digital image processing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR compression, de-blurring in frequency domain, abstraction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conversion, context enhancement, interactive as-rigid-as-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, adding depth, alpha matting.			
MI-MSI	Mathematical Structures in Computer Science	Z,ZK	4
Mathematical semantics of programming languages.			
MI-OLI	Linux Drivers	Z,ZK	4
The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining powerful processors and FPGAs increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development for master's students. The course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experience.			
MI-PDD.16	Data Preprocessing	Z,ZK	5
Students learn to prepare raw data for further processing and analysis. They learn what algorithms can be used to extract parameters from various data sources, such as images, texts, time series, etc., and learn the skills to apply these theoretical concepts to solve a specific problem in individual projects - e.g., parameter extraction from image data or from Internet.			
MI-PSL	Programming in Scala	Z,ZK	4
The course introduces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language features - e.g. pattern matching and advance standard library. Scala enables to use of applications functional patterns e.g. H-List, Monads, etc. Scala is used by many powerful frameworks and libraries e.g. Play, Cassandra, Scalaz, etc.			
MI-REV.16	Reverse Engineering	Z,ZK	5
Students will get acquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before and after the main function is called. Students will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated to reverse engineering of applications written in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be dedicated to debuggers: how debuggers and debugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer malware scene. The focus of the course is on the seminars, where students will solve practically oriented tasks from the real world.			
MI-SYP.16	Parsing and Compilers	Z,ZK	5
The module builds upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of various variants and applications of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.			
MI-TSP.16	Testing and Reliability	Z,ZK	5
Students gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to prepare a test set with the help of the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easy testable circuits and systems with built-in-self-test equipment. They will be able to analyze and control reliability and availability of the designed circuits.			
MI-VYC	Computability	Z,ZK	4
Classical theory of recursive functions and effective computability.			
NI-DDM	Distributed Data Mining	KZ	4
Course focuses on state-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands on experience with large scale data processing framework Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations and will be capable to propose approaches to parallelize other algorithms. The course is presented in czech language.			

NI-DZO	Digital Image Processing	Z,ZK	4
This course presents a comprehensive overview of modern methods for processing digital images and video. It mainly deals with practical algorithms used in professional image processing tools that are both easy to implement and have an interesting theoretical basis. Seemingly boring theorems from calculus, discrete mathematics, statistics and computer science come to life in visually attractive applications.			
NI-IAM	Internet and Multimedia	Z,ZK	4
The MI-IAM course is focused on principles and modern technologies for audio and video (AV) signal processing and transferring across Internet in real time. The syllabus covers the mechanisms of recording and reproducing of AV signals, data transfer formats, interfaces, codecs, communication protocols for transfers of AV data, stereoscopy, and other AV data processing methods. Students will learn practical use of AV transfers in real-time for interesting applications. Within the labs, students will practically assemble transfer AV pipelines using HW and SW technologies and verify practically the effect of various components on the quality and latencies of AV data transfers over Internet. Students will learn how to build Internet infrastructure for realizing complete high-quality AV transfers from recording the scene up to presentation for audience.			
NI-LSM	Statistical Modelling Lab	KZ	5
The subject is oriented on a low-level approach to Bayesian statistical and information-theoretical modelling, where the student both learns the existing methods (regression models, Kalman filtering, models fusion, etc.) and tries to implement them. That is, instead of the (standard) intensive use of high-level libraries like pandas, scikit-learn or statsmodels, the stress is put on the use of numpy and scipy, as well as the low-level algebra and calculus. The second half of the semester is focused on the design of methods and algorithms, and analyses of their properties. At this point, the subject is on the border of own research and may result in the topic of final work (diploma or bachelor thesis).			
NI-MOP	Modern Object-Oriented Programming in Pharo	KZ	4
Object-oriented programming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where its ability to natural abstraction is used to build complex modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills of design and implementation of object systems in modern pure object system Pharo ( <a href="https://pharo.org">https://pharo.org</a> ). The course focuses on individual approach to students, their development needs and areas of interest. In addition to deepening object programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work on interesting projects and OO technologies in terms of semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvement in the Pharo Consortium.			
NI-MPL	Managerial Psychology	ZK	2
This course is presented in Czech.			
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4
Mathematical semantics of programming languages.			
NI-OLI	Linux Drivers	Z,ZK	4
The Linux operating system is an important operating system for personal computer and also for embedded systems. Systems on chip and combining powerful processors and FPGAs increase the variability of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development for master's students. The course provides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical experience.			
NI-PDD	Data Preprocessing	Z,ZK	5
Students learn to prepare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data sources, such as images, texts, time series, etc., and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteristics from images or from web pages.			
NI-REV	Reverse Engineering	Z,ZK	5
Students will get acquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before and after the main function is called. Students will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated to reverse engineering of applications written in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be dedicated to debuggers: how debuggers and debugging work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the computer malware scene. The focus of the course is on the seminars, where students will solve practically oriented tasks from the real world.			
NI-SYP	Parsing and Compilers	Z,ZK	5
The module builds upon the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of various variants and applications of LR parsing and are introduced to special applications of parsers, such as incremental and parallel parsing.			
NI-TSP	Testing and Reliability	Z,ZK	5
Students gain knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to prepare a test set with the help of the intuitive path sensitization and to use an ATPG for automatic test generation. They will be able to design easy testable circuits and systems with built-in-self-test equipment. They will be able to analyze and control reliability and availability of the designed circuits.			
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
NI-VYC	Computability	Z,ZK	4
Classical theory of recursive functions and effective computability.			
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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