Study plan

Name of study plan: Bachelor program, unspecified specialization, in Czech, 2024

Faculty/Institute/Others:

Department:

Branch of study guaranteed by the department: Unspecified Specialisation of Study

Garantor of the study branch: doc. RNDr. Ing. Marcel Ji ina, Ph.D.

Program of study: Informatika Type of study: Bachelor full-time

Required credits: 123 Elective courses credits: 57 Sum of credits in the plan: 180

Note on the plan: Tato verze bakalá ského studijního plánu je ur ena pro ro níky, které byly p ijaty ke studiu od akademického roku 2024/2025 do prezen ní formy studia bakalá ského programu. . Garant: prof. Ing.

Róbert Lórencz, CSc. email: robert.lorencz@fit.cvut.cz

Name of the block: Compulsory courses in the program

Minimal number of credits of the block: 121

The role of the block: PP

Code of the group: BI-PP.21

Name of the group: Compulsory Courses of Bachelor Study Program Informatics, presented in Czech, version 2021

Requirement credits in the group: In this group you have to gain 106 credits

Requirement courses in the group: In this group you have to complete 20 courses

Credits in the group: 106

Note on the group:

If you plan to profile the specialization Information Security, Management Informatics, Computer Networks and Internet, Computer Systems and Virtualization, Software Engineering, or Web Engineering, enroll in the course BI-PSI.21 in your 2nd semester of study. If you plan to profile the specialization Computer Graphics, Computer Engineering, Computer Science, or Artificial Intelligence, enroll in the course BI-PSI.21 in your 4th semester of study. If you plan to profile yourself in the Artificial Intelligence specialization, enroll in the course BI-PST.21 in your 3rd semester of study. Otherwise, enroll in the course BI-PSI.21 in your 5th semester of study. Otherwise, enroll in the course BI-PSI.21 in your 3rd semester of study.

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-AG1.21	Algorithms and Graphs 1 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek Dušan Knop Dušan Knop (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-AAG.21	Automata and Grammars Jan Holub, Jan Janoušek Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-BAP.21	Bachelor Thesis Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	14		L,Z	PP
BI-BPR.21	Bachelor project Zden k Muziká Zden k Muziká (Gar.)	Z	1	0P+0C	Z,L	PP
BI-DBS.21	Database Systems Michal Valenta, Jan Blizni enko, Ji í Hunka, Monika Borkovcová, Jan Matoušek, Pavel K íž, Št pán Pechman, Dominik Roudný, Jan Bittner, Ji í Hunka Michal Valenta (Gar.)	Z,ZK	5	2P+2R+1L	L	PP
BI-DML.21	Discrete Mathematics and Logic Ji ina Scholtzová, Daniel Dombek, Jan Sp vák Daniel Dombek Jan Sp vák (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP
BI-KAB.21	Cryptography and Security Ivana Trummová, Tomáš Rabas, Tomáš Zahradnický, Ji í Bu ek, Martin Jure ek, Josef Kokeš, Róbert Lórencz, Julia Plotnikova, David Pokorný, Róbert Lórencz Róbert Lórencz (Gar.)	Z,ZK	5	2P+2C	L	PP
BI-LA1.21	Linear Algebra 1 Lud k Kleprlík, Jakub Krásenský, Karel Klouda Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+1R+1C	Z	PP

BI-MA1.21	Mathematical Analysis 1 Pavel Hrabák, Tomáš Kalvoda, Ivo Petr, Petr Olšák, Pavel Paták Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BI-MA2.21	Mathematical Analysis 2 Pavel Hrabák, Tomáš Kalvoda, Ivo Petr, Petr Olšák, Pavel Paták Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	6	3P+2C	Z	PP
BI-OSY.21	Operating Systems Petr Zemánek, Ji í Kašpar, Michal Štepanovský, Jan Trdli ka, Pavel Tvrdík, Ladislav Vagner Pavel Tvrdík Michal Štepanovský (Gar.)	Z,ZK	5	2P+1R+1L	L	PP
BI-PSI.21	Computer Networks Viktor erný, Michal Hažlinský, Vladimír Smotlacha, Yelena Trofimova, Jan Fesl, Josef Koumar, Petr Hoda, Josef Zápotocký, Michal Polák, Jan Fesl Jan Fesl (Gar.)	Z,ZK	5	2P+1R+1C	L	PP
BI-PST.21	Probability and Statistics Kamil Dedecius, Pavel Hrabák, Jitka Hrabáková, Petr Novák, Jana Vacková Pavel Hrabák Pavel Hrabák (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-PA1.21	Programming and Algorithmics 1 Radek Hušek, Jan Trávní ek, Miroslav Balík, Josef Vogel, Ladislav Vagner Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+2R+2C	Z	PP
BI-PA2.21	Programming and Algorithmics 2 Radek Hušek, Jan Trávní ek, Josef Vogel, Ladislav Vagner Jan Trávní ek Jan Trávní ek (Gar.)	Z,ZK	7	2P+1R+2C	L	PP
BI-SAP.21	Computer Structure and Architecture Hana Kubátová, Jaroslav Borecký, Petr Fišer, Martin Kohlík Hana Kubátová Hana Kubátová (Gar.)	Z,ZK	5	2P+1R+2C	L	PP
BI-TZP.21	Technological Fundamentals of Computers Jan ezní ek, Jaroslav Borecký, Robert Hülle, Martin Kohlík, Vojt ch Miškovský, Martin Novotný, Matúš Olekšák Martin Novotný Martin Novotný (Gar.)	Z,ZK	5	2P+2C	Z	PP
BI-GIT.21	SW Development Technologies Petr Pulc, Robin Ob rka Robin Ob rka Petr Pulc (Gar.)	Z	3	2P	Z	PP
BI-TDP.21	Documentation and Presentation Ond ej Guth, Petra Pavlí ková, Dana Vynikarová, Alena Libánská, Tomáš Nová ek Dana Vynikarová Dana Vynikarová (Gar.)	KZ	3	2P+2C	Z,L	PP
BI-UOS.21	Unix-like Operating Systems Zden k Muziká, Petr Zemánek, Viktor erný, Michal Hažlinský, Jakub Jan i ka, Miroslav Prágl, Michal Šoch, Jan Trdli ka, Yelena Trofimova, Zden k Muziká Zden k Muziká (Gar.)	KZ	5	2P+2C	Z	PP

Characteristics of the courses of this group of Study Plan: Code=BI-PP.21 Name=Compulsory Courses of Bachelor Study Program Informatics, presented in Czech, version 2021

BI-AG1.21 Algorithms and Graphs 1 Z,ZK 5
The course covers the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing curriculum. It links and partially develops the knowledge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the time and space complexity of algorithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asymptotic notation.

BI-AAG.21 Automata and Grammars

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, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the hierarchy of formal languages

 BI-BAP.21
 Bachelor Thesis
 Z
 14

 BI-BPR.21
 Bachelor project
 Z
 1

and they understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity classes P and NP.

1. At the beginning of the semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the partial tasks that he / she will perform during the semester to process the assignment. If he completes these tasks, the supervisor will award him a credit from the subject BI-BPR at the end of the semester. 2. The external supervisor enters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvut.cz/student/studijni/formulare). The completed and signed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the topic of the work that the student has reserved is formulated more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tuning the assignment so that the assignment can be supplemented and approved at the end of the semester.

BI-DBS.21 Database Systems Z,ZK 5

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-DML.21 Discrete Mathematics and Logic Z,ZK

Students will get acquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts from set theory will be explained. Special attention is paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The course also lays down the basics of combinatorics and number theory, with emphasis on modular arithmetics.

BI-KAB.21 Cryptography and Security Z,ZK 5

Students will understand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to use cryptographic keys and certificates in systems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in applications. Within labs, students will gain practical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedures of cryptanalysis.

BI-LA1.21 Linear Algebra 1 Z.ZK 5

We will introduce students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field of real and complex numbers and also over finite fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian elimination method (GEM) and show the connection with linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenvalues and eigenvectors of a matrix. We will also demonstrate some applications of these concepts in computer science.

BI-MA1.21 Mathematical Analysis 1 We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. Then we study real sequences and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions. This theoretical foundation is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and solution of simple optimization problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description of complexity of algorithms. BI-MA2.21 Mathematical Analysis 2 The course completes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will learn how to integrate by parts and use the substitution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to the computation of elementary functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, and its analysis using the Master theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and Hessian matrix, we study the analytical method of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integration of multivariate functions. BI-OSY.21 Operating Systems In this course that is a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread implementations, race conditions, critical regions, thread scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monitoring. They are able to design and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS Windows. BI-PSI.21 Computer Networks The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS. **Probability and Statistics** 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 for testing statistical hypotheses and determining the statistical dependence of two or more random variables. 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 and trees BI-PA2.21 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, list, set, table). They learn these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (e.g., template programming, copying/moving of objects, operator overloading, inheritance, polymorphism). Computer Structure and Architecture Students will get acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arithmetic-logic unit, controllers, memory, I/O communication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple processor is practically implemented in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools. Technological Fundamentals of Computers Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica. BI-GIT.21 **SW** Development Technologies 3 This course is aimed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to Git, the information manager from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use. BI-TDP.21 **Documentation and Presentation** ΚZ 3 The course is focused on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically final university theses. Students learn to create text of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically present it in front of classmates and exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed. Unix-like Operating Systems Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating

the teacher. The course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14 days of teaching. Within the

systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell.

Code of the group: BI-AAG 3/5 SEM

Name of the group: BI-AAG.21 in the third or fifth semester

Requirement credits in the group: In this group you have to gain 5 credits

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

Credits in the group: 5

Note on the group:

If you plan to profile the specialization Artificial Intelligence or Web Engineering, enroll in the course BI-AAG.21 for your 5th semester of study. Otherwise, enroll in the course BI-AAG.21 for

your 3rd semester of study

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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-AAG.21	Automata and Grammars Jan Holub, Jan Janoušek Jan Holub Jan Holub (Gar.)	Z,ZK	5	2P+2C	Z	PP

Characteristics of the courses of this group of Study Plan: Code=BI-AAG_3/5_SEM Name=BI-AAG.21 in the third or fifth semester

BI-AAG.21 Automata and Grammars

Z,ZK

5

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, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the hierarchy of formal languages and they understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity classes P and NP.

Code of the group: BI-PSI_2/4_SEM

Name of the group: BI-PSI.21 in the second or in the 4th semester

Requirement credits in the group: In this group you have to gain 5 credits

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

Credits in the group: 5

Note on the group: If you plan to profile the specialization Information Security, Management Informatics, Computer Networks

and Internet, Computer Systems and Virtualization, Software Engineering, or Web Engineering, enroll in the course BI-PSI.21 for your 2nd semester of study. - If you plan to profile the specialization Computer Graphics, Computer Engineering, Theoretical Informatics, or Artificial Intelligence, enroll in the course

BI-PSI.21 for your 4th semester of study.

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-PSI.21	Computer Networks Viktor erný, Michal Hažlinský, Vladimír Smotlacha, Yelena Trofimova, Jan Fesl, Josef Koumar, Petr Hoda, Josef Zápotocký, Michal Polák, Jan Fesl Jan Fesl (Gar.)	Z,ZK	5	2P+1R+1C	L	PP

Characteristics of the courses of this group of Study Plan: Code=BI-PSI_2/4_SEM Name=BI-PSI.21 in the second or in the 4th semester

BI-PSI.21 Computer Networks

7K

The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS.

Code of the group: BI-PST_3/5_SEM

Name of the group: BI-PSI.21 in the third or in the fourth semester

Requirement credits in the group: In this group you have to gain 5 credits

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

Credits in the group: 5

Note on the group: If you plan to profile yourself in the Artificial Intelligence specialization, enroll in the course

BI-PST.21 for your 3rd semester of study. Otherwise, enroll in the course BI-PST.21 for your

5th semester of study.

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-PST.21	Probability and Statistics Kamil Dedecius, Pavel Hrabák, Jitka Hrabáková, Petr Novák, Jana Vacková Pavel Hrabák Pavel Hrabák (Gar.)	Z,ZK	5	2P+2C	Z	PP

Characteristics of the courses of this group of Study Plan: Code=BI-PST_3/5_SEM Name=BI-PSI.21 in the third or in the fourth semester

BI-PST.21 Probability and Statistics

Z,ZK

5

Students will learn the basics of probabilistic thinking, the abile 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 for testing statistical hypotheses and determining the statistical dependence of two or more random variables.

Name of the block: Elective vocational courses in the branch/specialization

Minimal number of credits of the block: 0

The role of the block: VO

Code of the group: BI-PS-ALL.21

Name of the group: Profiling (future compulsory) courses of all specializations of the bc. program Informatics,

ver. 21

Requirement credits in the group:

Requirement courses in the group:

Credits in the group: 0

Note on the group: From this group, select courses that will later be compulsory for the specialization in

which you intend to profile.

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members)	Completion	Credits	Scope	Semester	Role
	Tutors, authors and guarantors (gar.)					
BI-ADU.21	Unix Administration Zden k Muziká, Petr Zemánek, Miroslav Prágl Zden k Muziká Zden k Muziká (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-AWD.21	Web and Database Server Administration Michal Valenta, Lukáš Ba inka Lukáš Ba inka Michal Valenta (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-AG2.21	Algorithms and Graphs 2 Dušan Knop, Michal Opler, Ond ej Suchý, Tomáš Valla, Radek Hušek Ond ej Suchý Ond ej Suchý (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-ASB.21	Applied Network Security Yelena Trofimova, Ji í Dostál, Jakub Tetera, Michal Polák, Martin Šutovský, Martin Mandík Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-APS.21	Architectures of Computer Systems Michal Štepanovský, Pavel Tvrdík Michal Štepanovský Pavel Tvrdík (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-BEK.21	Secure Code Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-BIG.21	DB Technologies for Big Data Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	2P+2C	Z,L	VO
BI-EPP.21	Economic Business Processes David Buchtela David Buchtela Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	L,Z	VO
BI-EHA.21	Ethical Hacking Ji í Dostál, Martin Kolárik, Andrej Šimko Ji í Dostál Ji í Dostál (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-FBI.21	Financial Business Intelligence David Buchtela David Buchtela Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	VO
BI-HWB.21	Hardware Security Ji í Bu ek Ji í Bu ek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-IOT.21	Internet of Things Viktor erný, Lenka Kosková Tísková Lenka Kosková Tísková (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-JPO.21	Computer Units Pavel Kubalík Pavel Kubalík (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-KOM.21	Conceptual Modelling Robert Pergl, Marek B Iohoubek Robert Pergl Robert Pergl (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-LA2.21	Linear Algebra 2 Daniel Dombek, Lud k Kleprlík, Karel Klouda, Marta Nollová, Jakub Šístek Lud k Kleprlík Karel Klouda (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-LOG.21	Mathematical Logic Kate ina Trlifajová Kate ina Trlifajová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-MDF.21	Modern Data Formats Petr Pauš Petr Pauš Petr Pauš (Gar.)	KZ	3	1P+1C	Z	VO
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-MGA.21	Multimedia and Graphics Applications Ji í Chludil, Lukáš Ba inka, Jan Buriánek, Šimon Tan v Lukáš Ba inka Ji í Chludil (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-OOP.21	Object-Oriented Programming Filip K ikava, Petr Máj, Filip íha Filip K ikava Filip K ikava (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-PGR.21	Computer graphics programming Petr Felkel, Jaroslav Sloup Jaroslav Sloup Petr Felkel (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-PRS.21	Practical Statistics Kamil Dedecius, Petr Novák Petr Novák (Gar.)	KZ	5	1P+2C	L	VO
BI-PNO.21	Practical Digital Design Martin Novotný Martin Novotný Martin Novotný (Gar.)	KZ	5	2P+2C	Z	VO
BI-PAI.21	Law and Informatics Zden k Ku era, Št pánka Havlíková, Dominik Vítek, Martin Samek, Ji í Maršál, Michal Mat jka Št pánka Havlíková Zden k Ku era (Gar.)	ZK	5	2P+2C	L	VO
BI-PJP.21	Programming Languages and Compilers Jan Janoušek, Tomáš Pecka Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	L	VO
BI-PPA.21	Programming Paradigms Jan Janoušek, Tomáš Pecka, Petr Máj, Tomáš Jakl Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+2R	Z	VO
BI-PGA.21	Programming of Graphic Applications Ji í Chludil, Radek Richtr Radek Richtr Radek Richtr (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-PJS.21	JavaScript Programming Martin Kolárik, Nikita Mironov Monika Borkovcová Monika Borkovcová (Gar.)	KZ	5	3C	L	VO
BI-PYT.21	Python Programming Martin Šlapák, Ji í Hanuš, Ond ej Bouchala, Mohamed Bettaz, Jan Šafa ík Martin Šlapák Martin Šlapák (Gar.)	KZ	5	3C	Z,L	VO
BI-PRR.21	Project management David Pešek David Pešek Petra Pavlí ková (Gar.)	Z,ZK	5	2P+2C	Z,L	VO

BI-SIP.21	Network Programming Jan Fesl Jan Fesl (Gar.)	Z	5	2P+2C	Z	VO
BI-SWI.21	Software Engineering Michal Valenta, Ji i Mlejnek, Zden k Rybola Zden k Rybola Michal Valenta (Gar.)	Z,ZK	5	2P+1C	L	VO
BI-SP1.21	Team Software Project 1 Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Marek Suchánek, Zden k Rybola Ji í Mlejnek (Gar.)	KZ	5	2C	L	VO
BI-SP2.21	Team Software Project 2 Stanislav Kuznetsov, Michal Valenta, Ji í Chludil, Ji í Mlejnek, Ji í Hunka, Zden k Rybola, Ji í Borský, Jan Matoušek, Radek Richtr, Ji í Mlejnek Ji í Mlejnek (Gar.)	KZ	5	2C	Z	VO
BI-SPS.21	Administration of Computer Networks and Services Jan Kubr, Libor Dostálek Pavel Tvrdík Libor Dostálek (Gar.)	Z,ZK	5	2P+2S	Z	VO
BI-ML1.21	Machine Learning 1 Karel Klouda, Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-ML2.21	Machine Learning 2 Daniel Vašata Daniel Vašata (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-SVZ.21	Machine vision and image processing Marcel Ji ina, Jakub Novák, David Kramný, Justýna Frommová Jakub Novák Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	L,Z	VO
BI-SRC.21	Real-time systems Hana Kubátová, Ji í Vysko il Jaroslav Borecký Hana Kubátová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-TJV.21	Java Technology Stanislav Kuznetsov, Jan Blizni enko, Ji í Dan ek, Raian Samerkhanov Ji í Dan ek	Z,ZK	5	2P+2C	Z	vo
BI-TPS.21	Computer Networks Technologies Vladimír Smotlacha, Josef Koumar Vladimír Smotlacha Vladimír Smotlacha (Gar.)	Z,ZK	5	2P+2S	Z	VO
BI-TIS.21	Information Systems Pavel Náplava Pavel Náplava (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-TUR.21	User Interface Design Jan Schmidt Jan Schmidt (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-TWA.21	Design of Web Applications David Bernhauer David Bernhauer (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-IDO.21	Introduction to DevOps Michal Valenta, Ji í Mlejnek, Tomáš Vondra, Zden k Rybola Tomáš Vondra Ji í Mlejnek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-UKB.21	Introduction to Cybersecurity Ivana Trummová, Jan B Iohoubek, David Pokorný, Jakub Tetera, František Ková, Martin Mandík, Tomáš Lu ák David Pokorný Jan B Iohoubek (Gar.)	Z,ZK	5	3P+1C	Z	VO
BI-VES.21	Embedded Systems Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-VDC.21	Virtualization and Data Centers Ji í Kašpar Ji í Kašpar Ji í Kašpar (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-VIZ.21	Data Visualization Magda Friedjungová Magda Friedjungová (Gar.)	KZ	5	3P	Z	VO
BI-VPS.21	Selected Topics in Computer Networking Alexandru Moucha, Mohamed Bettaz Pavel Tvrdik Mohamed Bettaz (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-VWM.21	Searching the Web and Multimedia Databases Ji í Novák, Tomáš Skopal Ji í Novák Tomáš Skopal (Gar.)	Z,ZK	5	2P+1C	L	VO
BI-FEM.21	Fundamentals of Economics Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-ZRS.21	Basics of System Control Kate ina Hyniová Kate ina Hyniová (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-ZSB.21	Basics of System Security Marián Svetlík, Martin Šutovský, Dominik Novák, Ladislav Marko Simona Forn sek Simona Forn sek (Gar.)	Z,ZK	5	2P+2C	Z	VO
BI-ZUM.21	Artificial Intelligence Fundamentals Pavel Surynek Pavel Surynek (Gar.)	Z,ZK	5	2P+2C	L	VO
BI-ZNS.21	Knowledge-based Systems Marcel Ji ina Marcel Ji ina (Gar.)	Z,ZK	5	2P+2C	Z	VO

Characteristics of the courses of this group of Study Plan: Code=BI-PS-ALL.21 Name=Profiling (future compulsory) courses of all specializations of the bc. program Informatics, ver. 21

BI-ADU.21 Unix Administration

Students will learn the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They will understand the differences between user and administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights, file systems, disk subsystems, processes, memory, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the knowledge from the lectures on specific examples from practice.

BI-AWD.21 Web and Database Server Administration

Students will get acquainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and backup complex database and web service systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of a web server.

BI-AG2.21 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-AG1.21. It further

delves into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English version of the course see

BIE-AG2.21.

BI-ASB.21 Applied Network Security The aim of the course is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gained in course BI-PSI with actual security applications like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishing the course student will get knowledge of security applications in computer networks. **Architectures of Computer Systems** Students will learn the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Special emphasis is given on the pipelined instruction processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the principles of instruction processing not only in scalar processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness of the sequential model of the program. The course further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory coherence and consistency in such BI-BEK.21 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. DB Technologies for Big Data BI-BIG.21 Students will be introduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is focused practically so that after finishing the course students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible method of data processing (data collection, transformation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretical foundation and presentation of individual technologies will be supplemented with specific examples from practice. **Economic Business Processes** Z,ZK The aim of the course is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and financial aspects of business in the market environment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the company's life cycle, from the establishment of the company, through the management of property and capital structure, financing of the company, determining the cost function of the company and labor costs, to evaluating the financial health of the company and its eventual rehabilitation or termination. BI-EHA.21 Z,ZK 5 **Ethical Hacking** The goal of the course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vulnerabilities, and their possible exploitation in computer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is on hands-on experience with vulnerabilities testing and the following process of penetration test documentation. BI-FBI.21 Financial Business Intelligence Z,ZK 5 The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. Hardware Security Z,ZK The course deals with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operating principles of cryptographic modules, security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers. BI-IOT.21 Internet of Things 7.7K The course focuses on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an overview of sensors and actuators, wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architectures for different application areas. Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environments (hardware - ARM, ESP, STM; software - Arduino, Raspberry Pi OS) BI-JPO.21 Computer Units 5 Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA). BI-KOM.21 Conceptual Modelling Z,ZK 5 The course is focused on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key terms in a domain, the ability to categorize and specify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological structural modeling in the OntoUML notation. Next, they learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data representation in the Internet. They also learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO method and the BPMN notation will be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up course: BI-ZPI. BI-LA2.21 Linear Algebra 2 Z,ZK 5 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový prostor v abstraktní obecné form Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafikou. Dalším velkým tématem bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat s d razem na rozklady matic. Ukážeme si také aplikace lineární algebry v r zných oborech BI-LOG.21 Z,ZK 5 Mathematical Logic The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability, logical equivalence, and the logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are explained. This relates to the P vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and their models. The syntactic approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems is explained. Methods of interfacing peripheral devices The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal serial bus (USB). The course includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows drivers, simple application development, and APIs of selected devices.

BI-MDF.21	Modern Data Formats	KZ	3
•	s to give an overview of commonly used data formats for typical types of data. There will be a description of each data type a s available to work with such data. After finishing the course, the students should know how to work with common data, e.g.		its used for that
	Modern Visualisation Technologies	Z,ZK	5
	s to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au	′	
_	e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the ment		
and procedural visualiza	tion, scientific data visualization, and 3D model scanning.		
BI-MGA.21	Multimedia and Graphics Applications	Z,ZK	5
• .	with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for wo		
• .	vill be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to to use multimedia transmission and representation systems, including real-time multimedia processing. They understand th	•	
	ards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models.	e principie di opei	allon and use
	Object-Oriented Programming	Z,ZK	5
	ming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together	, , , , , , , , , , , , , , , , , , ,	
course students get acq	uainted with the main principles of object-oriented programming and design, used in modern programming languages. The er	nphasis is on prac	ctical techniques
	which includes testing, error handing, refactoring, and application of design pattern.		
BI-PGR.21	Computer graphics programming	Z,ZK	5
	e, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design aterials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and		
	ne, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and represe		
	t, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and su	-	
BI-PRS.21	Practical Statistics	KZ	5
	duced to methods of applied statistics. They will learn how to work with various types of data, perform analyses, and choose it	-	
	on and correlation analysis, analysis of variance and non-parametric methods. Students will learn to use the statistical softw	are R and will app	ly the studied
methods on data from re BI-PNO.21	Practical Digital Design	KZ	5
	r ractical Digital Design v of the contemporary digital design flow and learn practical skills to use synchronous design techniques. They understand t	l	- 1
-	inologies FPGA and ASIC. Students demonstrate practical use of the design techniques in the course project using modern		1
tools.			
BI-PAI.21	Law and Informatics	ZK	5
	to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge	_	
-	ted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding coneir responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able		
	is. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection		
•	ch behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses o	-	
BI-PJP.21	Programming Languages and Compilers	Z,ZK	5
	mpiling methods of programming languages. They are introduced to intermediate representations used in current compilers (· ·
·	a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification guage but any text in a language generated by a given LL input grammar.	i. The compiler ca	n translate not
	Programming Paradigms	Z.ZK	5
	asic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of	, ,	-
programming paradigm	and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming	. The principles ar	re demonstrated
	on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern main	stream programm	ning languages
such as C++ and Java.	D : (O I: A I: I:	7 71/	
BI-PGA.21	Programming of Graphic Applications he possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and the	Z,ZK	5
•	matical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both usin		
by implementation of plu		,	33
BI-PJS.21	JavaScript Programming	KZ	5
	ction to Javascript programming. Students will also learn best practices and get acquai nted with tools that make code devel	opment in Javasc	ript easier.
BI-PYT.21	Python Programming	KZ	5
	to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for text and binary data structures of the Python programming language for the Pytho		
	rogramming in Python and in other programming languages will be explained. Each topic is prepared for students in the forn o individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semest		
the semester.	o individual stadont from Boloro additiab, stadonto pado a onon tost on the tast from topic. Four nomentatio place a comost	or work will be do	oignod dannig
BI-PRR.21	Project management	Z,ZK	5
The aim of the course is	to introduce students into the basic concepts and principles of project management, i.e. methods of planning, teamwork, and	alysis, crisis man	agement in a
• •	argumentation and meeting management. Students will practice project management techniques (e.g. SWOT analysis, risk		
	chedule, resource balancing, network graphs) and creation of project documentation. The course is designed especially for ge outside IT, consider starting their own company, or have ambitions to work in middle or senior management positions in I		
	e who will develop software or hardware in the form of team projects.	arge companies.	The course is
	Network Programming	Z	5
	mental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programming network applications.		
•	o designing communication protocols and their verification. The third part introduces the principles and applications of middle	•	
	models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in convergence.	mputer labs usino	g a chosen
BI-SWI.21	Software Engineering	Z,ZK	5
-	with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They	· .	-
• .	ne analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hand		
	e UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture desig	_	hin the course,
students also gain a the	pretical basis in the field of project management, estimation of costs of software projects, and methods of their development		

Team Software Project 1 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the BIE-SWI course that runs concurrently and that teaches students necessary techniques and principles. 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) both the formal and material aspects of the software design. The resulting software artefact will be further developed and finished in the BIE-SP2 course. BI-SP2.21 Team Software Project 2 ΚZ 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 BIE-SP1 course project. However, in this follow-up, the functionality, testing, and documentation of the software 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) the formal as well as material aspects of their solution. BI-SPS.21 Administration of Computer Networks and Services Z.ZK The aim of the course is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrated under the operating systems Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by practical hands-on experience with real network infrastructure. BI-ML1.21 Machine Learning 1 7.7K The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working knowledge of regression and classification models in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensional data visualization. In practical demonstrations, pandas and scikit libraries in Python will be used. Z.ZK BI-ML 2.21 Machine Learning 2 The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in particular, learn kernel methods and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the basic principles of reinforcement learning and natural language processing. BI-SVZ.21 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. Real-time systems Students obtain the basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues. Theoretical knowledge from lectures will be experimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are the same as in the BIE-VES course BI-TJV.21 Java Technology Z,ZK 5 The goal is to provide knowledge and skills for developing information systems and applications through concepts used in software development and experience with libraries and tools from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform. BI-TPS.21 Computer Networks Technologies Z,ZK 5 The course introduces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical layer with the overlap to the link layer. The lectures provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies will be demonstrated and with the most important ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethernet, modern wireless networks, always with focus on high-speed networks BI-TIS.21 Information Systems Z.ZK 5 The goal of this course is to familiarise students with the information systems topic and information systems implementation principles. During the course, students are introduced to "on the market" existing types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other types of information systems. The fundamental part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, ways of information systems implementation and information system implementation based on the project management principles. The emphasis is on the initial customer analysis, customer insight and ability to decide whether it is better to implement any existing information system or to develop a new one from scratch. These factors determine the information system implementation success At the end of the course information systems security, operation, support, maintenance, legislation impacts, and government information systems topics are discussed. User Interface Design Students gain a basic overview of methods for designing and testing common user interfaces. They get 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 methods that bring users into the development process to ensure optimal interface for them. **Design of Web Applications** 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 React. BI-IDO.21 Introduction to DevOps Z,ZK The course deals with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of systems and services. The course covers the tools to support software development, testing and compilation. It also focuses on tools for automating infrastructure management and building and deploying software to the Cloud. It is an introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquainted with modern technologies used in practice. BI-UKB.21 Introduction to Cybersecurity Z,ZK 5 The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspace and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations. Embedded Systems 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-VDC.21 Virtualization and Data Centers Z.ZK 5 The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses.

BI-VIZ.21 **Data Visualization**

The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language.

BI-VPS.21 Selected Topics in Computer Networking Z,ZK

The course builds upon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technologies used in modern computer networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical experience with real network devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and security.

BI-VWM.21 Searching the Web and Multimedia Databases Z,ZK

Students get basic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage of documents. In particular, students acquire information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from web pages. They get detailed knowledge of similarity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search engines for the mentioned data types (documents)

BI-FEM.21 Fundamentals of Economics Z.ZK

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The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics

Basics of System Control BI-7RS 21

The course gives an introduction to the field of automatic control. 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, description methods of system models, basic linear dynamic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. 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.

BI-ZSB.21 Basics of System Security

The goal of the course is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensic analysis and related topics such as malware analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of modern operating systems security, as well as skills needed for independent work in the area of operating system security incident analysis.

Artificial Intelligence Fundamentals

Basic course on introduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed to create it will be discussed, especially at the decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also by a non-physical entity, such as a virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art during the course.

Knowledge-based Systems

Students will become familiar with the systems based on knowledge (knowledge-based systems), which are systems that usetechniques of artificial intelligence to solve problems that require human judgment, learning and reasoning from findingsand actions. The course introduces students to the philosophy and architecture of knowledge-based systems to support decision-makingand planning. The course assumes knowledge of set theory, probability theory, artificial neural networks, and evolutionary algorithms.

Name of the block: Povinná zkouška z angli tiny

Minimal number of credits of the block: 2

The role of the block: PJ

Code of the group: BI-ZKA.21

Name of the group: English Language Exam

Requirement credits in the group: In this group you have to gain at least 2 credits (at most 4)

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

Credits in the group: 2

Note on the group:

BI-ANG, ending with an exam for two credits, is enrolled by students who have completed preparator English courses and have a credit from the BI-A2L course.
 --
br> BI-ANG1, ending with an exam for two credits, is enrolled by students who prepared for the exam independently and do not have credit from BI-A2L. These students must complete a credit paper before their own exam. After passing the exam, the student will also --
br> The BIE-ECC course can be recognized for any active semester after the submission of a external certificate at the level of at least B2 according to the Common European Framework of Reference

continuate at the level of at least B2 abbertaing to the Comment European't famowork of Nelstrende.							
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-ANG1	English Language Examination without Preparatory Courses Kate ina Valentová Kate ina Valentová (Gar.)	Z,ZK	2	2D	L	PJ	
BIE-EEC	English language external certificate Zden k Muziká Zden k Muziká Zden k Muziká (Gar.)	Z	4	2D	L	PJ	
BI-ANG	English Language, Internal Certificate Kate ina Valentová Kate ina Valentová (Gar.)	ZK	2	2D	Z,L	PJ	

Characteristics of the courses of this group of Study Plan: Code=BI-ZKA.21 Name=English Language Exam

BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2				
BIE-EEC	English language external certificate	Z	4				
The RIE-ECC course c	The RIF.ECC course can be recognized for any active competer after the submission of a certificate certificate that demonstrates their proficiency in English comparable to or exceeding						

the B2 level of the Common European Framework of Reference for Languages

BI-ANG English Language, Internal Certificate ZK 2
Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-ANG

Name of the block: Povinná t lesná výchova, sportovní kurzy

Minimal number of credits of the block: 0

The role of the block: PT

Code of the group: BI-PT.24

Name of the group: Physical Education, version 2024

Requirement credits in the group:

Requirement courses in the group: In this group you have to complete at least 2 courses (at most 7)

Credits in the group: 0

Note on the group:

The student is obliged to successfully complete two courses of this 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
TVK1	Physical Education Luboš Neuman Ji í Drnek (Gar.)	Z	1		L,Z	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.24 Name=Physical Education, version 2024

TV1	Physical Education	Z	0
TVV	Physical education	Z	0
TVK1	Physical Education	Z	1
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: Elective courses Minimal number of credits of the block: 0

The role of the block: V

Code of the group: BI-V.2021

Name of the group: Purely Elective Courses of Bachelor Programme Informatics, version from 2021/22 till

2024/25

Requirement credits in the group: Requirement courses in the group:

Credits in the group: 0

Note on the group:

reduce 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-ADW.1	Windows Administration Ji í Kašpar, Miroslav Prágl Miroslav Prágl (Gar.)	Z,ZK	4	2P+1C	Z	V
BI-ALO	Algebra and Logic Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+1C	L	V
BI-AVI.21	Algorithms visually Lud k Ku era Lud k Ku era (Gar.)	Z,ZK	4	2P+1C	L	V
BI-A2L	English language, preparation for the B2 level exam Kate ina Valentová Kate ina Valentová (Gar.)	Z	2	2C	L	V
BI-APJ	Aplication Programming in Java Ji í Dan ek	Z,ZK	4	2P+1R+1C	Z	V

NI-AFP	Applied Functional Programming Robert Pergl, Marek Suchánek, Daniel N mec Robert Pergl Robert Pergl (Gar.)	KZ	5	2P+1C	L	V
BIE-ZUM	Artificial Intelligence Fundamentals Pavel Surynek	Z,ZK	4	2P+2C	L	V
BI-BLE	Blender Lukáš Ba inka Lukáš Ba inka Lukáš Ba inka (Gar.)	Z,ZK	4	2P+2C	L	V
NI-DSP	Database Systems in Practes Tomáš Vichta Tomáš Vichta (Gar.)	Z,ZK	4	2P+1C	L	V
BI-STO	Storage and Filesystems	Z,ZK	4	2P+2C	L,Z	V
NI-PSD	Public Services Design David Pešek, Ond ej Brém David Pešek Ond ej Brém (Gar.)	KZ	4	1P+2C		V
BIE-DIF	Differential equations Antonella Marchesiello, Jan Valdman, Ond ej Bouchala Tomáš Kalvoda Ond ej Bouchala (Gar.)	Z,ZK	5	2P+2C	L	V
NI-DZO	Digital Image Processing	Z,ZK	4	2P+1C	L	V
NI-DDM	Distributed Data Mining	KZ	4	3C	L	V
BI-EP1.24	Effective programming 1 Martin Ka er Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	Z	V
BI-EP2	Efficient Programming 2 Martin Ka er Martin Ka er Martin Ka er (Gar.)	KZ	4	2P+2C	L	V
BI-ANGK	English language, contact preparation for the B2 level exam Kate ina Valentová Kate ina Valentová (Gar.)	Z	2	2C	Z,L	V
BI-EJA	Enterprise Java Ji i Dan ek	Z,ZK	4	2P+2C	L	V
BI-EJK	Enterprise Java and Kotlin Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-FMU	Financial and Management Accounting	Z,ZK	5	2P+2C	Z	V
BI-HAM	HW accelerated network traffic monitoring Tomáš ejka, Karel Hynek Tomáš ejka Tomáš elka (Gar.)	KZ	4	2P+1C	L	V
BI-HMI	History of Mathematics and Informatics Alena Šolcová Alena Šolcová (Gar.)	Z,ZK	3	2P+1C	L	V
BI-ARD	Interactive applications on Arduino Jan ezní ek, Ji í Cvr ek, Robert Hülle, Vojt ch Miškovský Robert Hülle Robert Hülle (Gar.)	KZ	4	3C	L	V
NI-IAM	Internet and Multimedia Ji i Melnikov	Z,ZK	4	2P+1C	L	V
BIE-CSI	Introduction to Computer Science Christoph Kirsch Christoph Kirsch (Gar.)	Z	2	2C	Z	V
FITE-EHD	Introduction to European Economic History Tomáš Evan	Z,ZK	3	2P+1C	L	V
BIE-IMA2	Introduction to Mathematics 2 Karel Klouda	Z	2	1C	Z	V
BI-CS2	C# language and data access Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	0P+3C	Z	V
BI-CS3	Language C# - design of web applications Pavel Št pán Pavel Št pán Pavel Št pán (Gar.)	KZ	4	3C	Z	V
BI-SQL.1	Language SQL, advanced Michal Valenta Michal Valenta (Gar.)	KZ	4	3C	L	V
BI-QAP	Quantum algorithms and programming Tomáš Kalvoda, Ivo Petr Ivo Petr (Gar.)	KZ	5	1P+2C	Z	V
NI-LSM	Statistical Modelling Lab Kamil Dedecius Kamil Dedecius (Gar.)	KZ	5	3C	L	V
BI-HAS	Human Aspects in Cryptography and Security Ivana Trummová Ivana Trummová Ivana Trummová (Gar.)	Z,ZK	5	2P+1C	Z	V
NI-MPL	Managerial Psychology Jan Fiala Jan Fiala (Gar.)	ZK	2	2P	Z,L	V
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4	2P+1C	L	V
BI-MPP.21	Methods of interfacing peripheral devices Miroslav Skrbek Miroslav Skrbek (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MIT	Mikrotik technologies Jan Fest Jan Fest (Gar.)	KZ	3	1P+2C	Z	V
NI-MOP	Modern Object-Oriented Programming in Pharo Jan Blizni enko Robert Pergl Robert Pergl (Gar.)	KZ	4	3C	Z	V
BI-MVT.21	Modern Visualisation Technologies Ji í Chludil, Petr Pauš Petr Pauš (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-MMP	Multimedia team project Zde ka echová Zde ka echová Zde ka echová (Gar.)	KZ	4	3C	Z,L	V
BI-ORL	Operations Research and Linear Programming Dušan Knop Dušan Knop Dušan Knop (Gar.)	KZ	5	1P+2C	L	V
NI-OLI	Linux Drivers Miroslav Skrbek, Jaroslav Borecký Jaroslav Borecký Miroslav Skrbek (Gar.)	Z,ZK	4	2P+2C	L	V

BI-ACM2 BI-ACM3 P O O O O O O O O O O O O O O O O O O	Tomáš Valla Tomáš Valla Tomáš Valla (Gar.) Programming Practices 2 Dond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.) Programming Practices 3 Dond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.) Programming Practices 4 Dond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.) Programming for the Android Operating System Ian Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.) Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán Gar.) Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.) JavaScript Programming Old ich Malec Programing in Kotlin Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Scala Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in Shell 2 Lukáš Ba inka Data Preprocessing Marcel Ji ina Marcel Ji ina (Gar.)	KZ KZ KZ KZ KZ Z,ZK Z,ZK Z,ZK Z,ZK Z,ZK	5 5 4 4 4 4 4 4	4C 4C 4C 3C 3C 2P+2C 3C 2P+2C 2P+1C	Z L Z L L,Z Z,L L	V V V V V V
BI-ACM3 BI-ACM4 BI-ACM4 BI-AND.21 BI-CS1 BI-PJV BI-PJS.1 BI-PJS.1 BI-PHP.1 BI-PS2 NI-PDD D BI-PKM D D D D D D D D D D D D D	Programming Practices 3 Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.) Programming Practices 4 Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.) Programming for the Android Operating System Ilan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.) Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán Gar.) Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.) JavaScript Programming Old ich Malec Programming in Kotlin Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Scala Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	KZ KZ KZ KZ Z,ZK Z,ZK Z,ZK Z,ZK Z,ZK KZ	5 4 4 4 4 4	4C 4C 3C 3C 2P+2C 3C 2P+2C	L Z L,Z Z,L L	V V V V V
BI-ACM4 BI-ACM4 BI-AND.21 BI-CS1 BI-PJV BI-PJS.1 BI-PJS.1 BI-PS2 NI-PDD BI-PKM DO DO DO DO DO DO DO DO DO D	Programming Practices 4 Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.) Programming for the Android Operating System Jan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.) Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán Gar.) Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.) JavaScript Programming Old ich Malec Programing in Kotlin Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Scala Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	KZ KZ KZ Z,ZK KZ Z,ZK Z,ZK Z,ZK KZ	5 4 4 4 4 4	3C 3C 2P+2C 3C 2P+2C	Z L L,Z Z,L	V V V V V
BI-AND.21 BI-CS1 BI-PJV BI-PJS.1 BI-KOT NI-PSL BI-PMA BI-PHP.1 BI-PS2 NI-PDD D BI-PKM	Programming for the Android Operating System Jan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.) Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán Gar.) Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.) JavaScript Programming Old ich Malec Programing in Kotlin Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Scala Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	KZ KZ Z,ZK KZ Z,ZK Z,ZK Z,ZK KZ	4 4 4 4	3C 3C 2P+2C 3C 2P+2C	L,Z Z,L L	V V V V
BI-CS1 BI-PJV BI-PJS.1 BI-PJS.1 BI-KOT NI-PSL BI-PMA BI-PHP.1 BI-PS2 NI-PDD D M BI-PKM In	lan Mottl, Jan Vep ek, Marek Kodr, Petr Šíma Jan Mottl Marek Kodr (Gar.) Programming in C# Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán Gar.) Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.) DavaScript Programming Old ich Malec Programing in Kotlin Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Scala Ili í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	KZ Z,ZK KZ Z,ZK Z,ZK Z,ZK KZ	4 4 4	3C 2P+2C 3C 2P+2C	L,Z Z,L L	V V
BI-CS1 Process (G) BI-PJV BI-PJS.1 BI-PJS.1 BI-KOT NI-PSL BI-PMA BI-PHP.1 BI-PS2 NI-PDD D M BI-PKM Interpretable (G) Process (G) Process	Pavel Št pán, Helena Wallenfelsová Helena Wallenfelsová Pavel Št pán Gar.) Programming in Java Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.) JavaScript Programming Old ich Malec Programing in Kotlin Il í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Scala Il í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	Z,ZK KZ Z,ZK Z,ZK Z,ZK Z,ZK KZ	4 4 4	2P+2C 3C 2P+2C	Z,L L	V
BI-PJV M M M BI-PJS.1 Ji BI-KOT P NI-PSL P Ji D BI-PMA P BI-PHP.1 P BI-PS2 P NI-PDD D BI-PKM In	Miroslav Balík, Jan Blizni enko, Ji í Borský, Jan Zimolka Miroslav Balík Miroslav Balík (Gar.) JavaScript Programming Old ich Malec Programing in Kotlin Ii í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Scala Ii í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	KZ Z,ZK Z,ZK Z,ZK KZ	4 4	3C 2P+2C	L	V
BI-KOT	Old ich Malec Programing in Kotlin If Dan ek Ji Dan ek Ji Dan ek (Gar.) Programming in Scala If Dan ek Ji Dan ek Ji Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	Z,ZK Z,ZK Z,ZK KZ	4	2P+2C		
NI-PSL P Ji BI-PMA P Zc BI-PHP.1 P BI-PS2 P I NI-PDD D M BI-PKM Im	Programming in Scala If if Dan ek Ji if Dan ek Ji if Dan ek (Gar.) Programming in Scala If if Dan ek Ji if Dan ek Ji if Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	Z,ZK Z,ZK KZ	4		L	V
NI-PSL PJi BI-PMA PZO BI-PHP.1 P BI-PS2 PJO NI-PDD DM BI-PKM Interpretable	Programming in Scala Ji í Dan ek Ji í Dan ek Ji í Dan ek (Gar.) Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programing in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	Z,ZK KZ		2P+1C		
BI-PMA	Programming in Mathematica Zden k Buk Zden k Buk Zden k Buk (Gar.) Programming in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	KZ	4		Z	V
BI-PHP.1 P BI-PS2 P NI-PDD D BI-PKM In	Programing in PHP Programming in shell 2 Lukáš Ba inka Data Preprocessing	KZ		2P+2C	Z,L	V
BI-PS2 P I I I I I I I I I I I I I I I I I I	Programming in shell 2 Lukáš Ba inka Data Preprocessing		4	3C	Z	V
NI-PDD D M BI-PKM In	Data Preprocessing	Z,ZK	4	2P+2C	L	V
BI-PKM In	Marcol li ina Marcol li ina Marcol li ina (Gar.)	Z,ZK	5	2P+1C	Z	V
	ntroduction to mathematics			21 +10		-
D	Tomáš Kalvoda Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z	4		Z	V
Jo	Reverse Engineering Josef Kokeš Josef Kokeš (Gar.)	Z,ZK	5	1P+2C	Z	V
	Computer Engineering Seminar I Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
	Computer Engineering Seminar II Hana Kubátová Hana Kubátová Hana Kubátová (Gar.)	Z	4	2C	L,Z	V
BI-ST1	Network Technology 1 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	٧
BI-ST2 N	Network Technology 2 Alexandru Moucha (Gar.)	Z	3	3C	L	٧
BI-ST3	Network Technology 3 Alexandru Moucha Alexandru Moucha (Gar.)	Z	3	2C	Z	V
BI-ST4 N	Network Technology 4	Z	3	2C	L	V
BLSK I 21	Alexandru Moucha Alexandru Moucha (Gar.) Scripting Languages	Z,ZK	4	2+2	L	V
Lu	ukáš Ba inka, Jan Ž árek Lukáš Ba inka Jan Ž árek (Gar.) Machine Oriented Languages	Z,ZK	4	2P+2C	L	V
	World Economy and Business	Z,ZK	4	2P+2C		V
111 021	Tomáš Evan	Z,ZR	4		L	V
DI-SEI To	Norld Economy and Business Tomáš Evan Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	4	2P+2C	L	V
	Parsing and Compilers Jan Janoušek Jan Janoušek Jan Janoušek (Gar.)	Z,ZK	5	2P+1C	Z	V
	Version control system GIT Petr Pulc	KZ	2	16P	Z,L	V
BIE-SEG S	Systems Engineering Christoph Kirsch Christoph Kirsch (Gar.)	Z	0	2C	Z	V
TVK1 P	Physical Education Luboš Neuman Ji í Drnek (Gar.)	Z	1		L,Z	V
	Physical education	Z	0	0+2	Z,L	V
	Physical Education	Z	0	0+2	Z	V
	Physical education	Z	0	0+2	Z,L	V
	Physical Education	Z	0	0+2	L	V
	Physical Education 2	Z	1		L,Z	V
	Physical Education Course	Z	0	7dní	L	V
	Physical Education Course	Z	0	7dní	Z	V
BI-TS1 T	Theoretical Seminar I Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS2	Theoretical Seminar II Dušan Knop, Ond ej Suchý, Tomáš Valla Tomáš Valla Ond ej Suchý (Gar.)	Z	4	2C		

	T			1 1		
BI-TS3	Theoretical Seminar III Ond ej Suchý, Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	Z	V
BI-TS4	Theoretical Seminar IV Ond ej Suchý, Tomáš Valla Tomáš Valla Tomáš Valla (Gar.)	Z	4	2C	L	V
BI-TDA	Test driven architecture Marek Hakala	KZ	4	2P+1C	Z,L	V
NI-TSP	Testing and Reliability Petr Fišer Martin Da hel Petr Fišer (Gar.)	Z,ZK	5	2P+2C	Z	V
BI-QUA	Quality Assurance Marek Kodr, Martin Pilný, Kate ina Kalášková Kate ina Kalášková Marek Kodr (Gar.)	KZ	4	3C	Z	V
FI-TOP	Academic writing Tomáš Nová ek	Z	2	10B	Z	V
BI-CCN	Compiler Construction Christoph Kirsch Christoph Kirsch (Gar.)	Z,ZK	5	2P+1C	L	V
BI-TEX	TeX and Typography Petr Olšák Petr Olšák Petr Olšák (Gar.)	Z,ZK	4	2P+1C	L	V
BI-EHD	Introduction to European Economic History Tomáš Evan Tomáš Evan (Gar.)	Z,ZK	3	2P+1C	Z,L	V
BI-KSA	Cultural and Social Anthropology Tomáš Houdek, Alena Libánská, Jakub Šenovský Jakub Šenovský Alena Libánská (Gar.)	ZK	2	2P	Z,L	V
BI-ULI	Introduction to Linux Zden k Muziká , Petr Zemánek, Jan Ž árek Zden k Muziká Zden k Muziká (Gar.)	Z	2	4D	Z	V
BI-OPT	Introduction to Optical Networks Pavel Tvrdík	Z,ZK	4	2P+1C	Z	V
NI-VCC	Virtualization and Cloud Computing Tomáš Vondra, Jan Fesl Tomáš Vondra (Tomáš Vondra (Gar.)	Z,ZK	5	2P+1C	L	V
BI-VHS	Virtual game worlds Radek Richtr	ZK	4	2P+2C	Z	V
BI-VR1	Virtual reality I Petr Pauš, Petr Klán Petr Klán (Gar.)	KZ	4	2P+2C	L,Z	V
BI-VR2	Virtual reality II Petr Klán Petr Klán Petr Klán (Gar.)	KZ	3	1P+2C	L	V
BI-VAK.21	Selected Applications of Combinatorics Michal Opler Michal Opler Michal Opler (Gar.)	Z	3	2R	L	V
BI-VMM	Selected Mathematical Methods Marzieh Forough Tomáš Kalvoda Tomáš Kalvoda (Gar.)	Z,ZK	4	2P+2C	L	V
NI-VYC	Computability Jan Starý Jan Starý Jan Starý (Gar.)	Z,ZK	4	2P+2C	L	V
BI-ZS10	Bachelor internship abroad for 10 credits Zden k Muziká Zden k Muziká (Gar.)	Z	10		Z,L	V
BI-ZS20	Bachelor internship abroad for 20 credits Zden k Muziká Zden k Muziká (Gar.)	Z	20		Z,L	V
BI-ZS30	Bachelor internship abroad for 30 credits Zden k Muziká Zden k Muziká (Gar.)	Z	30		Z,L	V
BI-ZIVS	Intelligent Embedded System Fundamentals Miroslav Skrbek Miroslav Skrbek (Gar.)	KZ	4	1P+3C	Z	V
BI-ZPI	Process engineering Robert Pergl Robert Pergl (Gar.)	KZ	4	1P+2C	L	V
BI-ZNF	PHP Framework Nette - basics Ji í Chludil	KZ	3	2P+1C	L	V
BI-IOS	Fundamentals of iOS Application Development for iPhone and iPad Rostislav Babá ek, Igor Rosocha Martin P Ipitel Martin P Ipitel (Gar.)	KZ	4	2C	Z	V
BI-ZWU	Introduction to Web and User Interfaces Lukáš Ba inka Lukáš Ba inka Jakub Klímek (Gar.)	Z,ZK	4	2P+2C	L	V
BI-3DT.1	3D Printing Miroslav Hron ok, Tomáš Sýkora Tomáš Sýkora Miroslav Hron ok (Gar.)	KZ	4	3C	L	V

Characteristics of the courses of this group of Study Plan: Code=BI-V.2021 Name=Purely Elective Courses of Bachelor Programme

	on from 2021/22 till 2024/25		
BI-MPP.21	Methods of interfacing peripheral devices	Z,ZK	5
The course is focused of	on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Univ	ersal serial bus (L	JSB). The course
includes both PC side a	and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of t	JSB devices, Linu	ıx and Windows
drivers, simple applicat	ion development, and APIs of selected devices.		
BI-MVT.21	Modern Visualisation Technologies	Z,ZK	5
The goal of the course	is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and au	gmented reality,	visualization on
high resolution displays	: (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the ment	ioned technologie	s, namely fractal
and procedural visualiz	ation, scientific data visualization, and 3D model scanning.		
TV1	Physical Education	Z	0
TVV	Physical education	Z	0
TVK1	Physical Education	Z	1
TVV0	Physical education	Z	0
TV2	Physical Education	Z	0

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ANICEOLUTE. MICH DEN DE DEDITOREN DO MICEOLUTA.	ne course will introduppliers (devs and depurse is aimed at stu- IE-DIF nis course provides a variables. Key theorolynomial analysis, fortrial differential equal desplicit Euler method in the course presents and interest in the course presents and interest in the course focuses on state processing frame opproaches to parallel I-EP1.24 ne course is taught in I-EP2 ontinuation of Efficie in the aim to choose I-ANGK ne content of the courtier part in the languates with the success ass of the term. I-EJA ne course is on advandatabase and are accourse is on accourse is on advandatabase and are accourse is on accourse is	ce students to specifics of UX, Service design and development for public sector. We will look into the design and developme signesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaborat dents-designers as well as clients. Differential equations foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essent ems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered fllowed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world applicat titions (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving OD lods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs. Digital Image Processing a comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical in interesting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that sing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HD straction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, as earlies image stitching and cloning, digital photo-montage, color-to-gray possible image deformation, free-form image registration of machine learning algorithms. Students will gain han work Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementation are ore and avoid implementation errors. Efficient Programming 1 Effective programming 1. Students will practice implementation of algorithms by solving typical problems. Vario	Interprocess from the front process from the	e perspective esentatives. 5 s like separar characteristic roduction to uding implicit estate the dom estate the dom estate the final terms during the final terms during the final terms during the econnected 4

operations in accounts and accounting statements including of economic operations based on current methods of double- Business Inteligence moduls in Business information system	eory of accounting, the principles of balancing the property amounts and liabilities in the opening and closing of bookkeeping. The course provides students with a legal modificentry bookkeeping for enterprising subjects in the Czech Republic. Principles of manages.	cation of bookkeep gement accounting	ing, description g are base of
network traffic are mandatory skills to network operators (pla	ffic monitoring technologies and principles in the area of network infrastructure and traffic monitoring. Inning and development of resources and infrastructure) and security analysts alike (as s with the modern trends and cornerstone principles in the area of monitoring network	a source of inforn	nation and data
BI-HMI History of Mathematics and This course is presented in Czech.	Informatics	Z,ZK	3
kits and control varied peripherals with help of available library	Arduino study as introduction to embedded systems. Students will learn how to design simple appries. The goal of the subject is to show varied software approaches to control embedde the gher (objective) layer, this platform is frequently used for artist performance and therefore.	ed systems, i.e. to s	see the results
presentation of AV signals (output), network communication paudiovisual transmissions. Within the labs, students will pract	nnologies for network transmissions of audiovisual (AV) signals. The syllabus includes a protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practitically assemble AV transmission chains using HW and SW technologies and verify the rn how to build Internet infrastructure for end-to-end AV transmissions from the recording	cal use case scen effect of various of	arios of real-time components on
science, high-school students, anybody with a background in and relate basic principles of computer science for students t done the way they are, and even how, on a basic yet represe	cience te for broad audiences: bachelor students in computer science, students majoring in othe tabasic math and the desire to understand the absolute basics of computer science. The to understand, early on, what computer science is, why things such as high-level progra entative and practically relevant level. After taking the class, students are able to answer th courses to take next and which books to follow up with, ideally realizing if they are int	e goal of the class amming languages r not just basic cor	is to introduce s and tools are nputer science
FITE-EHD Introduction to European Ed The course introduces a selection of themes from the Europe of the key periods in history. As European countries have bee area of Roman Empire to fragmentation of the Middle Ages, it does not cover detailed economic history of particular Europe	conomic History ean economic history. It gives the student basic knowledge about forming of the global en dominant actors in this process it focuses predominantly on their roles in the econor from destruction of WWII to the current affairs, the development of modern financial ins ean countries but rather the impact of trade and role of particular events, institutions an	mic history. From la stitutions is deciphe	arge economic ered. The course
meetings will consist of a mixture of lecture and discussion. BIE-IMA2 Introduction to Mathematics Students refresh and extend knowledge of elementary function examples.	2 ons and their properties. Students understand basic mathematical principles and they a	Z are able to apply th	2 nem in particular
get to know objects used to retrieve data - Connection, Comr of features for querying and updating data, integrated directly and LINQ to SQL). Another objective is the Entity Framework	SS oduce students several data access technologies - database, XML, NoSQL - on the Mic mand, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current te y with the .NET platform languages, which enable LINQ use with Objects, XML and SQ x - an object-relational mapper that enables .NET developers to work with relational dat ase First, Model First approaches. The students will also get to know the Conceptual M	echnologies such a L (LINQ to Object a using domain-sp	as LINQ - a set s, LINQ to XML pecific objects
BI-CS3 Language C# - design of we The students will be introduced to current technologies in web on thisplatform. They will learn to create WebAPI and to use	application development on the .NET platform. They will acquire a comprehensive overv	KZ iew of the develop	4 ment possibilities
triggers, recursive queries, OLAP support, object-relational costructures like indexes, clusters, index-organized tables, and	become familiar with advanced relational and non-relational features of SQL language. Instructions. Part of the course is dedicated to practical database optimization from the properties of the course is dedicated to practical database optimization. Execution plans that is a second of the course	oint of view of spec and possibilities	cialized database of its. changes
are based, and algorithms showing advantages and limitation	antum computers and their programming. We focus on fundaments of quantum mechanions of quantum computing. During tutorials students work in open-source software deveor of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-V	lopment kit Qiskit,	which is based
available information and its modeling using numpy and scipe At this point, the subject is on the border of own research and	The student both learns the existing methods and tries to implement them. The stress i y. The second half of the semester is focused on the design of methods and algorithms d may result in the topic of final work (diploma or bachelor thesis).	, and analyses of t	
BI-HAS Human Aspects in Cryptogr. This course is for students interested not only in technical so use their gained knowledge to design, plan and analyse their	ope of computer science, but also in making products usable - for users and for develop	Z,ZK pers. Students of t	5 his course can
	5 p. 6/5/5010 in the context of number contered decounty.	71/	2
NI-MPL Managerial Psychology NI-MSI Mathematical Structures in 0	·	ZK Z,ZK	4
Mathematical semantics of programming languages. Data type Introduction to category theory.	pes as continous lattices, Scott topology. Procedures as continuous mappings. The Sco	or model of lambd	a calculus.

BI-MIT	Mikrotik technologies	KZ	3
	the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are c providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the		
	and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary compute	, ·	
	data-link, network and transport layer of the OSI model.		
	Modern Object-Oriented Programming in Pharo	KZ	4
· · ·	nming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, who modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the s		
·	dern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development	_	•
· -	bject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to wo		-
_	f semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involv	γ	_
BI-MMP This course is presented	Multimedia team project d in Czech.	KZ	4
BI-ORL	Operations Research and Linear Programming	KZ	5
The subject aims to intro	oduce students to the issues of operational research and primarily to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of linear programming as a fundable to the practical application of the practical applicat	damental optimiza	ation technique.
	imarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (such as m		
NI-OLI	Linux Drivers	Z,ZK	4
	item is an important operating system for personal computer and also for embedded systems. Systems on chip and combining of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver developme		
•	dge of Linux operating system architecture, principles of development of various types drivers, including practical experience		
BI-ACM	Programming Practices 1	KZ	5
BI-ACM2	se for preparing talented student for representation in international programming contests. Programming Practices 2	KZ	5
-	se for preparing talented student for representation in international programming contests.	KZ	5
	Programming Practices 3	KZ	5
This is a selective cours	se for preparing talented student for representation in international programming contests.	'	
BI-ACM4	Programming Practices 4 se for preparing talented student for representation in international programming contests.	KZ	5
BI-AND.21	Programming for the Android Operating System	KZ	4
This course is presented	, , , ,		·
BI-CS1	Programming in C#	KZ	4
-	s to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamenta		
	, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class de properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debuggi		٠. ا
well as work with files a		ng and oxooption	processing, as
BI-PJV	Programming in Java	Z,ZK	4
· ·	d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-PJS.1	JavaScript Programming	KZ	4
-	is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases developmen nts of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register for BIE-TWA.1. They should register fo	•	
of study.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
BI-KOT	Programing in Kotlin	Z,ZK	4
	cally-styled object-functional language that exploits the extensive Java language ecosystem while delivering a number of adv		
	va compliant and allows for mixed projects that preserve existing parts written in Java, and continue with the development of plate code. Last but not least, Kotlin is suitable for designing of DSLs (Domain-Specific Languages).	a modern, object-	-iurictional way
NI-PSL	Programming in Scala	Z,ZK	4
The course introduces t	he modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language feat		matching and
•	y. 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. F	Play, Cassandra,
Scalaz, etc. BI-PMA	Programming in Mathematica	Z,ZK	4
	g with modern technical and scientific software. Students will learn how to use different programming styles (functional progra		
_	amic interactive applications and visualisations, data processing and presentations.		
BI-PHP.1	Programing in PHP	KZ	4
-	Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices a		
•	e course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register in their 3rd semester of study.	OF BIE-TWA.1. IF	ney snould
BI-PS2	Programming in shell 2	Z,ZK	4
	l overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In add		
	er particular scripting languages and will get practical experience with shell script programming.		
NI-PDD	Data Preprocessing	Z,ZK	5
	re raw data for further processing and analysis.They learn what algorithms can be used to extract information from various da arn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of character		-
pages.			
BI-PKM	Introduction to mathematics	Z	4
This course is presented		<u> </u>	
NI-REV	Reverse Engineering	Z,ZK	5
- ·	nted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens l Inderstand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is ded		
	++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be disassemblers.		
	ng work and which methods can be used to detect it. One of the lectures will be dedicated to the latest trends on the comput	er malware scene	e. The focus of
the course is on the sen	ninars, where students will solve practically oriented tasks from the real world.		

BI-SCE1	Computer Engineering Seminar I	Z	4
·	ter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistance		
• • • • • • • • • • • • • • • • • • • •	ually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of t	,	
•	ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach	thers. The topics a	are new for each
semester.	Occupantes Funda contra Occupant	7	4
BI-SCE2	Computer Engineering Seminar II	Z	4
· ·	ter Engineering is a (s)elective course for students who want to deal with deeper topics of digital design, reliability and resistanc ually within the subject. Each student or group of students solves some interesting topic with the selected supervisor. Part of t		
	ssional literature and/or work in K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teach	-	
semester.	solonal inerature and/or work in the transfer in the capacity of the subject is infinited by the possibilities of the seminal teat	iners. The topics a	are new for each
BI-ST1	Network Technology 1	Z	3
_	to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredite		-
CCNA1 - R&S Intro		24 411401 1110 G1001	o i ioladaa
BI-ST2	Network Technology 2	Z	3
This course is presente	1	_	J
BI-ST3	Network Technology 3	7	3
	nance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented durin		- 1
	the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, pre-	_	
simple topology, securit		,,	
BI-ST4	Network Technology 4	Z	3
	hance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switchin		-
	her extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effi		-
	gy, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completel		-
Broadcast Multiple Acce	ess) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and swit	ch firmware, perfc	orm password
recoveries, and emerge	ency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigate	ation ways while r	naintaining the
network running.			
BI-SKJ.21	Scripting Languages	Z,ZK	4
Students gain a genera	overview of available scripting languages, their syntax, semantics, programming style, data structures, pros and cons. In ad	dition, they gain a	deeper insight
into shell and some other	er particular scripting languages and will get practical experience with shell script programming.		
BI-SOJ	Machine Oriented Languages	Z,ZK	4
Students of the course v	will gain an ability to create their own programs in the assembly language of the most common PC platform focusing on optimal	I use of microproc	essor's features
and efficient cooperation	n of software with hardware. Next, there will be discussed x86 specifics of the majority of OSes from the application point of view	w linked to higher	level languages.
This knowledge will be	used during reverse engineering, optimization, and evaluation of code security.		
FIT-SEP	World Economy and Business	Z,ZK	4
This course is presente	d in Czech. The course introduces students of technical university to the international business. It does that predominantly by	comparing indivi	dual countries
and key regions of world	d economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as wel	I as indexes of eco	onomic freedom,
· · · · · · · · · · · · · · · · · · ·	ic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form c	of discussions bas	ed on individual
	o take bachelor level of this course BIE-SEP as a prerequisite.		
BI-SEP	World Economy and Business	Z,ZK	4
	d in Czech. The course introduces students of technical university to the international business. It does that predominantly by		
	d economy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as wel		
•	ic development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of	of discussions bas	ed on individual
	o take bachelor level of this course BIE-SEP as a prerequisite.	7.71	
NI-SYP	Parsing and Compilers	Z,ZK	5
•	the knowledge of fundamentals of automata theory, formal language and formal translation theories. Students gain knowledge of	of various variants	and applications
<u> </u>	ntroduced to special applications of parsers, such as incremental and parallel parsing.	177	
BI-GIT	Version control system GIT	KZ	2
	ced to basic principles of version control systems. These principles will be then shown on DCVS Git both theoretically and pro		articular system
	n details will be shown. Students will be challenged to use Git as users, project managers, team leaders as well as Git server		_
BIE-SEG	Systems Engineering	Z	0
=	class on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles		
•	or and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking the second of the class of the	_	
	ce between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what co ocesses and threads synchronize efficiently to overcome concurrency for communication.	incurrency is, as o	pposed to
<u> </u>		7	4
TV2K1	Physical Education 2	Z	1
BI-TS1	Theoretical Seminar I	Z	4
	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class		-
	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is	a work with scier	ntific papers and
	e. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS2	Theoretical Seminar II	Z	4
	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a class		
	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is e. The capacity is limited by the the potentials of the teachers of the seminar.	a work with scier	nuilic papers and
		7	4
BI-TS3	Theoretical Seminar III	Z	4
	ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a clas and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is		
· · · · · · · · · · · · · · · · · · ·	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a. The capacity is limited by the the potentials of the teachers of the seminar.	, a work with sole!	mio papers and
BI-TS4	Theoretical Seminar IV	Z	4
	Theoretical Seminar IV ntended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a clas		
	and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is		
· · · · · · · · · · · · · · · · · · ·	e. The capacity is limited by the the potentials of the teachers of the seminar.		o paporo unu
, morature	1		

BI-TDA	Test driven architecture	KZ	4
	on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that a		· · · · · · · · · · · · · · · · · · ·
	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		-
NI-TSP	Testing and Reliability ledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to p	Z,ZK	5 with the help of
	zation and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with		
	analyze, and control the reliability and availability of the designed circuits.		
BI-QUA	Quality Assurance	KZ	4
	students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context		
•	sperience hands-on application testing using both manual and automated testing. At the end of the semester, the student short test appears test data, sustants on appropriate partial of the seepsiles, and propers a report on the burst found		
FI-TOP	f test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found Academic writing	7	2
	Academic writing ant and required part of research activity. It is not only about obtaining research results but also about applying them in the for	_	
	ful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the co	-	-
write a scientific article,	what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting	an article and revi	ewing someone
	e will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester.	Dates will be dete	ermined based
on the availability of enr		7.71	
BI-CCN	Compiler Construction	Z,ZK	5
-	class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching theme		students to
BI-TEX	TeX and Typography	Z,ZK	4
	d in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the	, ,	
rules.			
BI-EHD	Introduction to European Economic History	Z,ZK	3
	d in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		
BI-KSA	Cultural and Social Anthropology	ZK	2
	se aims to acquaint students with the basics of social and cultural anthropology as a scientific discipline dealing with the diver	•	
shown. The course is pr	h from our "exotic" cultures (topics: kinship, religion, social exclusion, migration, globalization, , material culture, language, he	aitn, nistory, deati	n, etc) will be
BI-ULI	Introduction to Linux	Z	2
	ar with the basics of the Linux operating system using e-learning form. They learn to work with the command line and become		
	ix-like system. Topics can be studied first theoretically and then practically verified in a virtual machine (terminal).		
BI-OPT	Introduction to Optical Networks	Z,ZK	4
-	view of optical networking technology with the emphasis on practical utilization in Internet and in network infrastructures, on po	· ·	
•	lology and on their solutions. The course will include the history of optical communications, an overview of passive componen		
•	rs, and others), and an overview of active components (optical switches and amplifiers, high-speed coherent transmission sys ics presented at premium research conferences, such as ECOC or OFC. Attention will also be paid to new applications, such	,	
	ansfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters		
from practice.			
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
_	ledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	-	
•	zation principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to effices of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effecti		
	x computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skill	•	·
	(Continuous integration and development).		
BI-VHS	Virtual game worlds	ZK	4
	nts to create a complex virtual world. The course is a continuation of basic graphical courses (MGA, PGR, BLE,). This current st	-	
	neory of game design, principles of writing dialogues and characters in order to create a functional and complex virtual world.	The course can b	e followed by
	the task of converting scenes and their dynamics into a fully virtual environment suitable for VR devices.	1/7	4
BI-VR1	Virtual reality I eality I eality operating system and virtual reality creation. Another objective is to meet the rules and requirements	KZ	4 communication
	the ways of teaching using virtual reality technologies and interactive activities in educational virtual 3D worlds. It improves co		
and shared social activi		·	
BI-VR2	Virtual reality II	KZ	3
	rse Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The ol	ojective is to deve	lop applications
•	nd gamification in various social metaverse and desktop engines.		
BI-VAK.21	Selected Applications of Combinatorics	Z	3
	oduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some ba		
	tion of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) in		
will select problems to b	be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimi	zation and more.	Students will
	olutions to the studied problems with a special focus on the effective use of existing tools.		
BI-VMM	Selected Mathematical Methods	Z,ZK	4
-	an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then a introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the		
	problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples.	wavelet transioni	TVC GAAIIIIIE
NI-VYC	Computability	Z,ZK	4
Classical theory of recu	rsive functions and effective computability.	· '	

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 re	esearch institution	n. 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 professi	ional content an	d 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 c	correspond to 4 v	veeks 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 subject	s 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 re	esearch institution	on. 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 professi	ional content an	d 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 c	correspond to 4 v	veeks 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 subject	s 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 re	esearch institution	on. 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 professi	ional content an	d 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 c	•	
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 subject	s if the internship
exceeds the academic year's dead-line.		,
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		o teach students
modern humanoid robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion co	ntrol sensor res	
		0
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		0
technologies.	t practical exper	0
		0
technologies.	t practical exper	ience with these
technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles o 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 but	KZ of process model usiness process	ience with these 4 ling and they will es using modern
technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles o 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 but CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information systems.	KZ of process model usiness process	ience with these 4 ling and they will es using modern
technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles o 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 but	KZ of process model usiness process	ience with these 4 ling and they will es using modern
technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles o 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 but CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information systems.	KZ of process model usiness process	ience with these 4 ling and they will es using modern
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technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles or 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 but CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information enterprise. BI-ZNF PHP Framework Nette - basics	KZ of process model usiness process rmation and bus	4 ling and they will es using modern iness strategy of
technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles or 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 be CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information enterprise. BI-ZNF PHP Framework Nette - basics 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	KZ of process model usiness process rmation and bus	4 ling and they will es using modern iness strategy of
technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles or 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 be CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of information enterprise. BI-ZNF PHP Framework Nette - basics 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 knowledge should serve for the efficient creation of a web backend in PHP language.	KZ of process model usiness process rmation and bus KZ popular framewo	4 ling and they will es using modern iness strategy of 3 ork. The resulting
technologies. BI-ZPI Process engineering Students will learn fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles or 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 be CASE tools. The role of process engineering for information systems development is discussed as well as its importance in the overall context of infor an enterprise. BI-ZNF PHP Framework Nette - basics 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 knowledge should serve for the efficient creation of a web backend in PHP language. BI-IOS Fundamentals of iOS Application Development for iPhone and iPad	KZ of process model usiness process rmation and bus KZ popular framewo	4 ling and they will es using modern iness strategy of 3 ork. The resulting

Code of the group: BI-V-PRO_MG

3D Printing

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:

BI-3DT.1

Courses in this group are recommended for students who intend to enroll to master

ΚZ

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	Algorithms and Graphs 2 Ond ej Suchý	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,ZN) 3	ı
This course, presented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulso	ry course BI-AG1	. It further delves	
into advances data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English vi	ersion of the cour	se see BIE-AG2.	

List of courses of this pass:

Code	Name of the course	Completion	Credits	
BI-3DT.1	3D Printing	KZ	4	
BI-A2L	English language, preparation for the B2 level exam	Z	2	
The content of the	e content of the course corresponds to the preparation for the English exam at the B2 level. 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 succ	ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by ind class of the term.	ividual teachers du	uring the first
BI-AAG.21	Automata and Grammars	Z,ZK	5
	uced to basic theoretical and implementation principles of the following topics: construction, use and mutual transformations of finite		•
	ars, context-free grammars, construction and use of pushdown automata, and translation grammars and transducers. They know the ey understand the relationships between formal languages and automata. They are introduced to the Turing machine and complexity		
BI-ACM	Programming Practices 1 This is a selective course for preparing talented student for representation in international programming contests.	KZ	5
BI-ACM2	Programming Practices 2	KZ	5
BI-ACM3	This is a selective course for preparing talented student for representation in international programming contests. Programming Practices 3	KZ	5
BI-ACM4	This is a selective course for preparing talented student for representation in international programming contests. Programming Practices 4	KZ	5
BI-ADU.21	This is a selective course for preparing talented student for representation in international programming contests. Unix Administration	Z,ZK	5
	the internal structure of the UNIX operating system, with the administration of its basic subsystems and with the security principles. They		
	administrator roles. They will get theoretical and practical knowledge of user management and administration, of users access rights, ory, network services and remote access, and in the areas of system deployment and virtualization. In the labs, they will verify the kn specific examples from practice.		
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-AG1.21	Algorithms and Graphs 1	Z,ZK	5
	rs the basics of efficient algorithm design, data structures, and graph theory, belonging to the core knowledge of every computing cu vledge from the course BI-DML.21, in which students acquire the knowledge and skills in combinatorics necessary for evaluating the		
· ·	rithms. The course also follows up knowledge from BI-MA1.21, the practical usage of asymptotic mathematics, in particular, the asym	•	inpically of
BI-AG2	Algorithms and Graphs 2	Z,ZK	5
1	nted in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsory of structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For English versi		
BI-AG2.21	Algorithms and Graphs 2	Z,ZK	5
This course, pres	ented in Czech, introduces basic algorithms and concepts of graph theory as a follow=up on the introduction given in the compulsor	course BI-AG1.2	1. It further
	ces data structures and amortized complexity analysis. It also includes a very light introduction to approximation algorithms. For Eng BIE-AG2.21.	lish version of the	course see
BI-ALO	Algebra and Logic The course extends and deepens the study of topics touched upon in the basic course in logic.	Z,ZK	4
BI-AND.21	Programming for the Android Operating System This course is presented in Czech.	KZ	4
BI-ANG	English Language, Internal Certificate Course information and teaching materials can be found at https://moodle-vyuka.cvut.cz/course/search.php?search=BI-AN	ZK G	2
BI-ANG1	English Language Examination without Preparatory Courses	Z,ZK	2
BI-ANGK	English language, contact preparation for the B2 level exam	Z	2
	course corresponds to the preparation for the English exam at the B2 level. Requirements for course credit. Academic Achievement		
	language instructionMeet the requirements for writing assignments - Summary, Abstract, Argumentation PaperSucceed in both the ess rate set at 70%80% and over in BOTH tests means ORAL EXAM ONLY (no written part). Requirements will be specified by ind		
	class of the term.		g
BI-APJ	Aplication Programming in Java This course is presented in Czech. Advanced technologies in Java.	Z,ZK	4
BI-APS.21	Architectures of Computer Systems	Z,ZK	5
	In the construction principles of internal architecture of computers with universal processors at the level of machine instructions. Spec		
1 ' '	n processing and on the memory hierarchy. Students will understand the basic concepts of RISC and CISC architectures and the prin r processors, but also in superscalar processors that can execute multiple instructions in one cycle, while ensuring the correctness o	-	-
program. The cours	se further elaborates the principles and architectures of shared memory multiprocessor and multicore systems and the memory cohe systems.	rence and consiste	ency in such
BI-ARD	Interactive applications on Arduino	KZ	4
	gned for students of first grade of bachelor study as introduction to embedded systems. Students will learn how to design simple applicat Bried peripherals with help of available libraries. The goal of the subject is to show varied software approaches to control embedded s	•	-
	ay of a PC. Thanks to possible control on higher (objective) layer, this platform is frequently used for artist performance and therefore Software Engineering students.	-	
BI-ASB.21	Applied Network Security	Z,ZK	5
	irse is to introduce selected topics from computer networks in terms of cybersecurity. These topics extend the basic knowledge gaine		
security applicat	ions like the public key infrastructure, encrypted network protocols, link and network layer security or wireless networks. After finishin knowledge of security applications in computer networks.	g the course stude	ent will get
BI-AVI.21	Algorithms visually	Z,ZK	4
1	ments other algorithm courses at FIT. It brings knowledge about particular important algorithms from different fields of the computer so		-
knowledge presente	ed in BI-AG1 and BI-AG2. A wide scope of covered subject is made possible due to using visualization bz Algovision (www.algovision.org& that make understanding the principles of algorithms easy.	t;nttp://www.algovi	sion.org>)
BI-AWD.21	Web and Database Server Administration	Z,ZK	5
Students will get a	equainted with the administration of database and web servers and services. They will be able to install, configure, operate, test, and	backup complex d	atabase and
	rice systems. The principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of the principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of the principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of the principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of the principles will be demonstrated on the PostgreSQL relational database engine and Apache will be used as an example of the principles will be used as an example of the principles will be used as an example of the principles will be used as an example of the principles will be used as an example of the principles will be used as an example of the principles will be used as an example of the principles will be used as a principle of the principles will be used as a principle of the principles will be used as a principle of the principle of the principles will be used as a principle of the principle of	ri e	1
BI-BAP.21	Bachelor Thesis	Z	14

BI-BEK.21	Secure Code	Z,ZK	5
	earn how to assess security risks and how to take them into account in the design phase of their own code and solutions. After getting fa s gain practical experience with running programs with reduced privileges and methods of specifying these privileges, since not every		_
=	rileges. Dangers inherent in buffer overflows will be practically demonstrated. Students will be introduced to the principles of securing		
	database systems, web, remote procedure calls, and sockets in general. The module concludes with Denial of Service attacks and the		-
BI-BIG.21	DB Technologies for Big Data	KZ	5
	troduced into the field of Big Data processing where nonrelational (NoSQL) database engines are typically used today. The course is f		
_	e students were able to choose suitable tools (mostly open source) and techniques, design and implement a simplest reproducible me	=	
ollection, transfor	mation/aggregation, presentation). Students get acquainted with various architectures for processing and storing big data. A theoretic of individual technologies will be supplemented with specific examples from practice.	ai ioundation and p	presentation
BI-BLE	Blender	Z,ZK	4
	ids knowledge of opensource program Blender from BI-MGA (Multimedia and Graphics Applications) course. It is intended for those i		aphics and
animation. It	offers a complete and practically oriented introduction to Blender environment. Students may continue to BI-PGA (Programming graph	nics applications) c	ourse.
BI-BPR.21	Bachelor project	Z	1
-	ng of the semester, the student reserves the topic of the bachelor's thesis and connects with the supervisor. He / she will arrange the		
_	semester to process the assignment. If he completes these tasks, the supervisor will award him a credit from the subject BI-BPR at to renters the information on granting the credit using the form "Granting credit from the external supervisor of the final thesis" (http://fit.cvu		
· ·	d signed form must be delivered in person or by email to the SZZ coordinator, who will arrange for the credit to be granted. 3. If the top		-
as reserved is for	mulated more generally, the tasks assigned to him by the supervisor for the semester should be aimed primarily at fine-tuning the assigned	gnment so that the	assignment
	can be supplemented and approved at the end of the semester.		Г
BI-CCN	Compiler Construction	Z,ZK	5
	uctory class on compiler construction for bachelor students in computer science. The goal of the class is to introduce basic principles	-	
BI-CS1	and the design and implementation of programming languages. Seeing and actually understanding self-compilation is the overarching Programming in C#	KZ	s. 4
	Programming in C# urse is to introduce .NET Framework as a multi-language development platform. Then, programming language C#, its fundamental co		l
-	s, loops, definitions and calls of functions will be discussed. Attention is focused on the object oriented programming in C# - class def		
constructors, meth	nods, properties, static members, Garbage Collector, inheritance and polymorphism, collections, delegates, and generics. Debugging	and exception pro	cessing, as
	well as work with files are emphasized.		T
BI-CS2	C# language and data access	KZ	4
	and data access course objective is to introduce students several data access technologies - database, XML, NoSQL - on the Micros ts used to retrieve data - Connection, Command, Data Reader and DataAdapter v ADO.NET. Next, they will learn to use current tech	-	
-	erying and updating data, integrated directly with the .NET platform languages, which enable LINQ use with Objects, XML and SQL (I	_	
· · · · · · · · · · · · · · · · · · ·). Another objective is the Entity Framework - an object-relational mapper that enables .NET developers to work with relational data u		
ORM). This part o	of the course introduces Code First, Database First, Model First approaches. The students will also get to know the Conceptual Mode	, Storage Model ar	nd Mapping
	(XML description).		
BI-CS3	Language C# - design of web applications e introduced to current technologies in web application development on the .NET platform.They will acquire a comprehensive overview	KZ	4
ne students will b	on thisplatform. They will learn to create WebAPI and to use it by client programs.	or the development	possibilities
BI-DBS.21	Database Systems	Z.ZK	5
Students are into	roduced to the database engine architecture and typical user roles. They are briefly introduced to various database models. They lear	n to design small d	latabases
	constraints) using a conceptual model and implement them in a relational database engine. They get a hands-on experience with the		
	dation - the relational database model. They learn the principles of normalizing a relational database schema. They understand the funda-	· ·	
-	olling parallel user access to a single data source, as well as recovering a database engine from a failure. They are briefly introduced ases with respect to speed of access to large quantities of data. This introductory-level course does not cover: Administration of data		-
a.a.a.a.a.a	optimizing database applications, distributed database systems, data stores.	sace eyeteme, ace	aggg aa
BI-DML.21	Discrete Mathematics and Logic	Z,ZK	5
_	cquainted with the basic concepts of propositional logic and predicate logic and learn to work with their laws. Necessary concepts fro	m set theory will be	-
Special attention is	s paid to relations, their general properties, and their types, especially functional relations, equivalences, and partial orders. The cours	e also lays down tl	he basics of
DI ELIA 04	combinatorics and number theory, with emphasis on modular arithmetics.	7.71	-
BI-EHA.21	Ethical Hacking course is to introduce students to the field of penetration testing and ethical hacking. The course deals with cybersecurity threats, vuln	Z,ZK	5 ir possible
•	nputer networks, web applications, wireless networks, operating systems, and others like the Internet of Things or cloud. The focus is		•
. ,	vulnerabilities testing and the following process of penetration test documentation.	, , , , , , , , , , , , , , , , , , , ,	
BI-EHD	Introduction to European Economic History	Z,ZK	3
	This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753).		'
BI-EJA	Enterprise Java	Z,ZK	4
The course is on a	advanced technologies in the Java programming language. The focus is on technologies for development of enterprise information sy	stems which are co	onnected to
DIFIK	a database and are accessed through the web interface.	7 71/	1
BI-EJK	Enterprise Java and Kotlin dvanced technologies in the Java and Kotlin programming languages. The focus is on technologies for developing enterprise informa	Z,ZK	d nicroservice
110 000100 10 011 0	architecture, that can be deployed to the cloud.	ion dydionio wiai n	1110100011100
BI-EP1.24	Effective programming 1	KZ	4
	The course is taught in Czech.	·	·
BI-EP2	Efficient Programming 2	KZ	4
Continuation of E	fficient Programming 1. Students will practice implementation of algorithms by solving typical problems. Various ways of solving indivi	dual problems are	discussed,
DI EDDO1	with the aim to choose the best one and avoid implementation errors.	771	-
BI-EPP.21	Economic Business Processes urse is to present typical processes related to the usual life cycle of a company. The course focuses mainly on the basic economic and	Z,ZK	of husiness
	ronment of the Czech Republic and the basics of management. In the course, students are acquainted with the typical phases of the		
	the company, through the management of property and capital structure, financing of the company, determining the cost function of the		
	evaluating the financial health of the company and its eventual rehabilitation or termination.		

BI-FBI.21 Financial Business Intelligence Z,ZK The aim of the course is to acquaint students primarily with financial accounting as a tool for recording business operations and documents for business analysis, determining its value and other indicators for comparison with other companies and management decision process at the tactical and strategic level. The second view is management accounting as a tool for financial management and prediction of business development. Management accounting allows monitoring of the financial status and performance of business activities over several accounting periods, enables a multidimensional view of business data, enables to control effectively factors affecting the return on invested capital and to use value information to assess options related to future business decisions. The principles of management accounting, described in this course, are the basis of Business Intelligence modules in business information systems, decision support systems, and other knowledge-oriented systems. BI-FEM.21 Fundamentals of Economics The course allows the students to discover basics of economic theory, which will then be used in subsequent courses of economics and management. It contains a general overview of fundamental microeconomic and macroeconomic topics. 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 Inteligence moduls in Business information systems. **BI-GIT** Version control system GIT ΚZ 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 systems 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. SW Development Technologies This course is aimed at one of the rudimental team software development technology - version control. To be more specific, we will introduce students to Git, the information manager from hell, as Linus Torvalds nicknamed it, and provide a comprehensive guide into its depths, as well as for day-to-day use. BI-HAM HW accelerated network traffic monitoring ΚZ This course introduces students to modern and widely used technologies and principles in the area of network infrastructure and traffic monitoring. The monitoring and analysis of network traffic are mandatory skills to network operators (planning and development of resources and infrastructure) and security analysts alike (as a source of information and data for analysis). The goals of the course are to acquaint students with the modern trends and cornerstone principles in the area of monitoring network traffic on a hardware and software level and to develop their practical abilities in this field. **BI-HAS** Human Aspects in Cryptography and Security Z,ZK 5 This course is for students interested not only in technical scope of computer science, but also in making products usable - for users and for developers. Students of this course can use their gained knowledge to design, plan and analyse their own projects in the context of human-centered security. BI-HMI History of Mathematics and Informatics Z,ZK 3 This course is presented in Czech. BI-HWB.21 Hardware Security Z,ZK The course deals with hardware resources used to ensure security of computer systems including embedded ones. Students become familiar with the operating principles of cryptographic modules, security features of modern processors, and storage media protection through encryption. They will gain knowledge about vulnerabilities of HW resources, including side-channel attacks and tampering with hardware during manufacture. Students will have an overview of contact and contactless smart card technology including applications and related topics for multi-factor authentication (biometrics). Students will understand methods of efficient implementations of ciphers. BI-IDO.21 Introduction to DevOps Z,ZK 5 The course deals with the topic of DevOps and prepares future developers and administrators for a modern culture of development and operation of systems and services. The course covers the tools to support software development, testing and compilation. It also focuses on tools for automating infrastructure management and building and deploying software to the Cloud. It is an introduction to technologies that will then be discussed in more detail in related follow-up courses. The student will also get acquainted with modern technologies used in practice. **BI-IOS** Fundamentals of iOS Application Development for iPhone and iPad ΚZ This course is presented in Czech. BI-IOT.21 Internet of Things Z,ZK 5 The course focuses on an overview of technologies and development tools used in the field of the Internet of Things (IoT). Lectures are devoted to an overview of sensors and actuators, wireless communication technologies designed primarily for this area, and appropriate programming methods. They include an overview of IoT architectures for different application areas. Within the computer labs, students will gain practical experience with developing simple IoT systems using common development environments (hardware - ARM, ESP, STM; software - Arduino, Raspberry Pi OS). BI-JPO 21 Computer Units Students deepen their basic knowledge of digital computer units acquired in the obligatory course of the program (BIE-SAP), get acquainted in detail with the internal structure and organization of computer units and processors and their interactions with the environment, including accelerating arithmetic-logic units and using appropriate codes for implementation of multiplication. The organization of main memory and other internal memories (addressable, LIFO, FIFO and CAM) will be discussed in detail, including codes for error detection and correction for parallel and serial data transmissions. They will also get acquainted with the methodology of controller design, with the principles of communication of the processor with the environment and the architecture of the bus system. The problems will be practically evaluated in the labs and with the help of the educational microprogrammed processor simulator and programmable hardware design kits (FPGA). BI-KAB.21 Cryptography and Security Students will understand the mathematical foundations of cryptography and gain an overview of current cryptographic algorithms. They will be able to use cryptographic keys and certificates in systems based on them and learn the basics of safe use of symmetric and asymmetric cryptographic systems and hash functions in applications. Within labs, students will gain practical skills in using standard cryptographic methods with an emphasis on security and will also get acquainted with the basic procedures of cryptanalysis. BI-KOM.21 Conceptual Modelling The course is focused on developing abstract thinking and precise formulation skills using conceptual models. Students learn skills of discerning key terms in a domain, the ability to categorize and specify correct relations in complex systems of social reality, mostly enterprises and institutions. Students learn basics of ontological structural modeling in the OntoUML notation. Next, they learn how to express business rules and constraints using the OCL language and foundations of OWL/RDF semantic data representation in the Internet. They also learn the foundations of enterprise engineering, being a discipline for conceptual modelling of enterprises and institutes and their processes. The DEMO method and the BPMN notation will be taught. The course is designed with the respect to continuation in software implementations. Recommended optional follow-up course: BI-ZPI. 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).

BI-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 presented in Czech. BI-LA1.21 Linear Algebra 1 Z,ZK 5 We will introduce students to the basic concepts of linear algebra, such as vectors, matrices, vector spaces. We will define vector spaces over the field of real and complex numbers and also over finite fields. We will present the concepts of basis and dimension and learn to solve systems of linear equations using the Gaussian elimination method (GEM) and show the connection with linear manifolds. We define the regularity of matrices and learn to find their inversions using GEM. We will also learn to find eigenvalues and eigenvectors of a matrix. We will also demonstrate some applications of these concepts in computer science. BI-LA2.21 Linear Algebra 2 Studenti si v tomto p edm tu rozší í znalosti z p edm tu BI-LA1, kde se pracovalo pouze s vektory ve form n-tic ísel. Zde si zavedeme vektorový prostor v abstraktní obecné form Seznámíme se také s pojmem skalární sou in a lineární zobrazení, což nám dovolí ukázat souvislost s lineární algebrou, geometrií a po íta ovou grafikou. Dalším velkým tématem bude numerická lineární algebra, kde si ukážeme potíže s ešením soustav lineárních rovnic na po íta i a možnosti, jak se s tímto problémem vypo ádat s d razem na rozklady matic. Ukážeme si také aplikace lineární algebry v r zných oborech. BI-LOG.21 Mathematical Logic Z,ZK The course focuses on the basics of propositional and predicate logic. It starts from the semantic point of view. Based on the notion of truth, satisfiability, logical equivalence, and the logical consequence of formulas are defined. Methods for determining the satisfiability of formulas, some of which are used for automated proving, are explained. This relates to the P vs. NP problem and Boolean functions in propositional logic. In predicate logic, the course further deals with formal theories, such as arithmetics, and their models. The syntactic approach to mathematical logic is demonstrated on the axiomatic system of propositional logic and its properties. Gödel's incompleteness theorems is explained. BI-MA1.21 Mathematical Analysis 1 Z,ZK 5 We begin the course by introducing students to the set of real numbers and its properties, and we note its differences with the set of machine numbers. Then we study real sequences and real functions of a real variable. We gradually introduce the notions of limits of sequences and functions, continuous functions, and derivatives of functions. This theoretical foundation is then applied to root-finding problems (iterative method of bisection and Newtons method), construction of cubic interpolation (spline), and formulation and solution of simple optimization problems (i.e., the issue of finding extrema of functions). The course is closed with the Landaus asymptotic notation and methods of mathematical description of complexity of algorithms. Mathematical Analysis 2 The course completes the theme of analysis of real functions of a real variable initiated in BI-MA1 by introducing the Riemann integral. Students will learn how to integrate by parts and use the substitution method. The next part of the course is devoted to number series, and Taylor polynomials and series. We apply Taylors theorem to the computation of elementary functions with a prescribed accuracy. Then we study the linear recurrence equations with constant coefficients, the complexity of recursive algorithms, and its analysis using the Master theorem. Finally, we introduce the student to the theory of multivariate functions. After establishing basic concepts of partial derivative, gradient, and Hessian matrix, we study the analytical method of localization of local extrema of multivariate functions as well as the numerical descent method. We conclude the course with the integration of multivariate functions. BI-MDF.21 Modern Data Formats The goal of the course is to give an overview of commonly used data formats for typical types of data. There will be a description of each data type and the data formats used for that data type along with tools available to work with such data. After finishing the course, the students should know how to work with common data, e.g. on the Web. BI-MGA.21 Multimedia and Graphics Applications Z,ZK Students get acquainted with multimedia technologies and applications for 2D/3D bitmap and vector graphics. During the course, current tools for working with images, videos, 3D graphics and animation will be introduced. Students learn several basic techniques of creation and editing content in computer graphics, introduction to graphic formats, and compression technologies. They learn to use multimedia transmission and representation systems, including real-time multimedia processing. They understand the principle of operation and use of graphics processing cards. They gain a number of practical skills, such as vectorizing raster images, retouching photos, or creating 3D models. **BI-MIT** Mikrotik technologies The main motivation of the subject stands in the introduction of the RouterOS operating system and some network Mikrotik technologies which are commonly used by the small and middle internet service providers (ISPs). The students learn how to use and create the architectures of the network solutions which are based on the metallic, optical or wireless links and how to administrate and practically deploy them. The successful completion of this subject requires the previous knowledge of elementary computer networks concepts like protocols and technologies of the data-link, network and transport layer of the OSI model. BI-ML1.21 Z.ZK Machine Learning 1 The goal of this course is to introduce students to the basic methods of machine learning. They get theoretical understanding and practical working knowledge of regression and classification models in the supervised learning scenario and clustering models in the unsupervised scenario. Students will be aware of the relationships between model bias and variance, and know the fundamentals of assessing model quality. Moreover, they learn the basic techniques of data preprocessing and multidimensional data visualization. In practical demonstrations, pandas and scikit libraries in Python will be used. Machine Learning 2 The goal of this course is to introduce students to the selected advanced methods of machine learning. In the supervised learning scenario, they, in particular, learn kernel methods and neural networks. In the unsupervised learning scenario students learn the principal component analysis and other dimensionality reduction methods. Moreover, students get the basic principles of reinforcement learning and natural language processing. BI-MMP Multimedia team project ΚZ This course is presented in Czech. BI-MPP.21 Methods of interfacing peripheral devices Z,ZK 5 The course is focused on methods for interfacing of peripheral devices. Interfacing of real peripheral devices is focused on techniques based on Universal serial bus (USB). The course includes both PC side and peripheral devices side. Labs are practically oriented. Students gain experience with implementation of relevant parts of USB devices, Linux and Windows drivers, simple application development, and APIs of selected devices. BI-MVT.21 Modern Visualisation Technologies Z,ZK The goal of the course is to give an overview of modern visualization technologies and their principles, namely technologies related to virtual and augmented reality, visualization on high resolution displays (e.g., SAGE and video mapping) and their applications in practice. Several lectures deal with the content creation for the mentioned technologies, namely fractal and procedural visualization, scientific data visualization, and 3D model scanning. Z,ZK BI-OOP.21 Object-Oriented Programming 5 Object-oriented programming has been used in the last 50 years to solve computational problems by using graphs of objects that collaborate together by message passing. In this course students get acquainted with the main principles of object-oriented programming and design, used in modern programming languages. The emphasis is on practical techniques for developing software, which includes testing, error handing, refactoring, and application of design pattern. BI-OPT Introduction to Optical Networks Z.ZK 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 freque	ncy transfer, or sensor networks. The labs will focus on real work with optical components and on measurement of their parameters. from practice.	Students will solve	e real tasks
BI-ORL	Operations Research and Linear Programming	KZ	5
	o introduce students to the issues of operational research and primarily to the practical application of linear programming as a fundar	1	_
Operatio	nal research primarily focuses on the use of engineering methods (with a mathematical background) to solve practical problems (suc	ch as managemen	t).
BI-OSY.21	Operating Systems	Z,ZK	5
In this course that is	s a follow-up of the Unix-like operating systems course students deepen their knowledge in areas of OS kernels, process and thread im	plementations, rac	e conditions,
critical regions, three	ead scheduling, shared resource allocation and deadlocks, management of virtual memory and data storages, file systems, OS monitorial memory and data storages, file systems, OS monitorial memory and data storages.		ble to design
	and implement simple multithreaded applications. General principles are illustrated on operating systems Solaris, Linux, or MS W	/indows.	
BI-PA1.21	Programming and Algorithmics 1	Z,ZK	7
-	ability to formulate algorithms for solving basic problems and write them in the C language. They understand data types (simple, stru		
statements, function	ons, concept of recursion. They learn to analyse simple cases of algorithm complexity. They know fundamental algorithms for search	ing, sorting, and m	nanipulating
BI-PA2.21	with linked lists and trees.	7 71/	7
	Programming and Algorithmics 2 instruments of object-oriented programming and are able to use them for specifying and implementing abstract data types (stack, que	Z,ZK	rray list set
	n these skills using the C++ programming language and are introduced to all C++ features needed in object-oriented programming (_	=
(ab.0)	copying/moving of objects, operator overloading, inheritance, polymorphism).	orgr, tomplate prog	,
BI-PAI.21	Law and Informatics	ZK	5
	urse is to introduce students into the basic legal instruments that they will encounter in their practice. Students will gain knowledge or	I	_
	ill be alerted to the pitfalls that await them in business from the point of view of law. They will understand the process of concluding or	-	
environment, will k	now their responsibilities in working with the Internet, will be familiar with the institutes of intellectual property law, and will be able to	use commercial li	cense types
and open-source li	icenses. Emphasis will also be put on the legal protection of data on the Internet, the registration of Internet domains and protection	against their misus	se. Students
will also be aler	rted to such behaviour in the field of IT that can be classified as criminal under the Czech law. The course will also include analyses	of real cases from	practice.
BI-PGA.21	Programming of Graphic Applications	Z,ZK	5
The course will pre-	sent the possibilities of current professional open-source tools for image editing, video editing, 3D animation (GIMP, Blender) and their	use for visualization	on of specific
data (3D scenes, n	nathematical data). Emphasis will be placed on the possibilities of further enhancement of the presented software tools, both using b	uilt-in scripting lan	guages and
	by implementation of plugins.		T
BI-PGR.21	Computer graphics programming	Z,ZK	5
=	curse, students can program a simple interactive 3D graphical application like a computer game or scientific visualization, design the		_
_	nd materials (like wall surface, wood, sky), and set up the lighting. At the same time, they understand the fundamental principles and ter	-	
	pipeline, geometric transformations, or lighting model. They gain knowledge allowing orientation in computer graphics and representi pment, e.g., GPU programming and animations. They get used to techniques utilized in geometric modeling, modeling curves and surfa	_	=
			1
BI-PHP.1	Programing in PHP aught in Czech Main goal of the course is an introduction to PHP - language and technology. Students will learn also best practices	KZ	4
	PHP. The course is recommended for students of BIE-WSI-WI.2015 branch of study and do not have required knowledge to register		
do roiopinioni in	register for this course in their 3rd semester of study.		o, 00u.u
BI-P.IP21		7 7K	5
BI-PJP.21 Students learn ba	Programming Languages and Compilers asic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers G	Z,ZK	5 ey learn to
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Students learn ba	Programming Languages and Compilers asic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers G	NU and LLVM. The	ey learn to
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BI-PJS.1 Main goal of the recommended for s BI-PJS.21 The course is an BI-PJW BI-PKM BI-PMA Students will be wo BI-PNO.21 Students get an ov and implementation BI-PPA.21 The course deals we programming paract on lambda calculu BI-PRR.21 The aim of the coproject, communic Gantt charts, resideepening their k BI-PRS.21 The students will be	Programming Languages and Compilers asic compiling methods of programming languages. They are introduced to intermediate representations used in current compilers of its one of a translation of a text that conforms a given syntax, to a target code and also to create a compiler based on the specification. To only a programming language but any text in a language generated by a given LL input grammar. JavaScript Programming course is an introduction to Javascript programming. Students will learn also best practices and will use tool that eases development 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 the of study. JavaScript Programming in introduction to Javascript programming. Students will also learn best practices and get acquainted with tools that make code devel Programming in Java This course is presented in Czech. However, there is an English variant in the program Informatics (B1801 / 4753). Introduction to mathematics This course is presented in Czech. Programming in Mathematica This course is presented in Czech. Programming in Mathematica This course is presented in Czech. Programming in Mathematica This course is presented in Czech. Programming in Mathematica This course is presented in Czech. Programming of Mathematica This course is presented in Czech. Programming by the students will learn how to use different programming styles (functional programmet.), how to create dynamic interactive applications and visualisations, data processing and presentations. Practical Digital Design Perogramming Paradigms with basic paradigms of high-level programming languages, including their basic execution models, benefits, and disadvantages of patigm and its basic principles are explained in details. Logic programming is introduced as another way of declarative programming. The sand on Lisp (Racket) and Prolog programming languages. Moreover, usage of these principles is demonstrated on modern mainst such as C++	KZ tin Javascript. The his course in their 4 KZ tin Javascript. The his course in their 4 KZ copment in Javascri Z,ZK Z Z,ZK AZ AZ AZ AZ AZ AZ AZ AZ AZ	ey learn to ranslate not 4 e course is 4th semester 5 ipt easier. 4 4 4 rogramming, 5 bL language AD design 5 s. Functional emonstrated g languages 5 jement in a anagement, terested in e course is 5 1. The course

BI-PS2 Programming in shell 2 Z,ZK 4 Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, 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. Computer Networks The course introduces students to the principles of computer networking. It covers basic technologies, protocols, and services commonly used in local networks and in the Internet as well. The lectures will be amended by proseminars that introduce students into network programming and demonstrate the abilities of advanced network technologies. Students practically verify configurations and management of network devices in the lab within the environment of the operating systems Linux and Cisco IOS. BI-PST.21 Probability and Statistics 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 for testing statistical hypotheses and determining the statistical dependence of two or more random variables. BI-PYT.21 Python Programming The aim of the course is to get acquainted with basic efficient control and data structures of the Python programming language for text and binary data processing. The differences between philosophy of programming in Python and in other programming languages will be explained. Each topic is prepared for students in the format of a Jupyter notebook, which enables greater accent to individual student work. Before each lab, students pass a short test on the last week topic. Four homeworks plus a semester work will be assigned during the semester. BI-QAP Quantum algorithms and programming K7 5 Course aims at giving students hands-on experience with quantum computers and their programming. We focus on fundaments of quantum mechanics, on which quantum technologies are based, and algorithms showing advantages and limitations of quantum computing. During tutorials students work in open-source software development kit Qiskit, which is based on Python language. Knowledge of linear algebra at the level of BI-LA1 and BI-LA2 (or BI-LIN) is necessary. Previous completion of BI-MA2 or BI-VMM and experience with Python might be an advantage. No previous knowledge of physics is assumed. **Quality Assurance** This course introduces students to the fundamentals of testing and quality management. Students will learn what the role of a tester is in the context of different types of software development and will experience hands-on application testing using both manual and automated testing. At the end of the semester, the student should be prepared to perform a test analysis, design a set of test scenarios, prepare test data, automate an appropriate portion of the scenarios, and prepare a report on the bugs found in the product under test. Computer Structure and Architecture Students will get acquainted with the basic architecture and units of a digital computer, understand the structure, function, and implementation of arithmetic-logic unit, controllers, memory, I/O communication, methods of data transfers between the units. The logic design and the implementation of a program-controlled simple processor is practically implemented in the labs using programmable circuits (FPGA), a single-chip microcomputer, and modern design (EDA) tools. 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 K N laboratories. The capacity of the subject is limited by the possibilities of the seminar teachers. The topics are new for each semester. BI-SCF2 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 K N 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. Network Programming BI-SIP.21 7 5 The course covers fundamental topics of programming network applications. It consists of 4 parts. The introductory part is focused on low-level programming using BSD sockets. The second part is devoted to designing communication protocols and their verification. The third part introduces the principles and applications of middleware technologies. The final part introduces basic modern models of distributed computing - P2P and blockchain. All topics will be first explained theoretically and then practices in computer labs using a chosen programming language environment. BI-SKJ.21 Scripting Languages Students gain a general overview of available scripting languages, their syntax, semantics, programming style, data structures, 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-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-SP1.21 Team Software Project 1 ΚZ 5 Students gain hands-on experience with the analysis, design, and prototyping of a large-scale software system. Theoretical support is provided in the BIE-SWI course that runs concurrently and that teaches students necessary techniques and principles. 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) both the formal and material aspects of the software design. The resulting software artefact will be further developed and finished in the BIE-SP2 course. BI-SP2.21 ΚZ Team Software Project 2 5 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 BIE-SP1 course project. However, in this follow-up, the functionality, testing, and documentation of the software 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) the formal as well as material aspects of their solution. BI-SPS.21 Administration of Computer Networks and Services The aim of the course is to deepen the theoretical knowledge of network technologies and protocols in the environment of network servers administrated under the operating systems Linux and Windows. The course syllabus requires the knowledge at the level of courses BIE-PSI, BIE-VPS, and BIE-OSY. Practical skills will be gained by practical hands-on experience with real network infrastructure.

BI-SQL.1	Language SQL, advanced	KZ	4
	n knowledge obtained in BI-DBS. Students become familiar with advanced relational and non-relational features of SQL language. In pa queries, OLAP support, object-relational constructions. Part of the course is dedicated to practical database optimization from the point o	•	•
	exes, clusters, index-organized tables, and materialized views. as well as from the point of view query optimization. Execution plan ar		
will be discusse	ed. Lectures will usually discuss SQL standard, but many features will be demonstrated on Oracle DBMS. Seminars are based on Oracle DBMS. Seminars are based on Oracle DBMS.	acle DBMS and pa	rtially on
BI-SRC.21	Real-time systems	Z,ZK	5
	he basic knowledge in the real-time (RT) system theory and in the design methods for RT systems including the dependability issues		
	perimentally verified in computer labs. The course is mainly focused on embedded RT systems, therefore the design kits in the lab are course.	e the same as in th	ne BIE-VES
BI-ST1	Network Technology 1	Z	3
The subject is or	riented to providing the students basic information and practical skills from the area of digital and IP networks. The subject is acredited CCNA1 - R&S Introduction to Networks.	d under the Cisco	Netacad -
BI-ST2	Network Technology 2	Z	3
	This course is presented in Czech.		
BI-ST3	Network Technology 3	Z	3
	er enhance their knowledge acquired from previous BI-ST1 and BI-ST2 courses. Principles of routing and switching presented during E ded in the course. Students will be able to start fine-tune protocols' settings to gain certain advantages like increased efficiency, predi		
get further extern	simple topology, security, etc.	ctability, exterision	реуона а
BI-ST4	Network Technology 4	Z	3
	er enhance their knowledge already acquired from previous BI-ST1, BI-ST2, and BI-ST3 courses. Principles of routing and switching		
_	ot further extended in BI-ST3. Students were able to start fine-tune protocols' settings to gain certain advantages like increased effici		
	topology, security, etc. This module teaches students to configure and fine-tune Wide Area Networks and to experience a completely	= = =	•
	e Access) which radically differs from well-known Ethernet (broadcast) type of networks. Students will also manage router and switch nergency procedures. Also the security aspect is treated; students will learn possible intra- and inter-network attacks and the mitigatic	=	-
	network running.		g
BI-STO	Storage and Filesystems	Z,ZK	4
The student will lea	arn principles and current solutions of storage systems architecture. The module explains principles of data store, protection, and archi load balancing and high availability.	ving, as so as stor	age scaling,
BI-SVZ.21	Machine vision and image processing	Z,ZK	5
	are becoming a common part of life by being universally available. Related to this phenomenon is the need to process and evaluate in		_
<u>-</u>	s to different types of camera systems and a variety of methods for image and video processing. The course is focused on practical use	-	
	problems of practice that the graduates may encounter.		
BI-SWI.21	Software Engineering	Z,ZK	5
	ainted with methods of analysis and design of larger software projects that are typically designed and implemented in teams. They co	•	
_	ring the analysis and design of larger software systems that will be developed in the concurrent course BIE-SP1. Students get hands-o	•	
_	nguage UML for modeling and solving software problems. Students learn the basics of object-oriented analysis, architecture design a udents also gain a theoretical basis in the field of project management, estimation of costs of software projects, and methods of their	-	tne course,
BI-TDA	Test driven architecture	KZ	4
	cused on practical examples of how to develop, test, and deploy software with tools like GitLab, Docker, Kubernetes, and more that a		
world. This co	ourse 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 occu	r in the semester p	oroject.
BI-TDP.21	Documentation and Presentation	KZ	3
	sed on the basics of creating electronic documentation with emphasis on the creation of technical reports of a larger scope, typically fi		
	of a technical report in the LaTeX system, process an electronic presentation using the LaTeX Beamer system, and practically prese course is intended primarily for those students who have chosen the topic of their bachelor's thesis or will choose it within the first 14		
the teacher. The	exercises of the course, an active approach to the creation of individual parts of the bachelor's thesis is assumed.	days of teaching.	vviaiiii aic
BI-TEX	TeX and Typography	Z,ZK	4
This course is pres	ented in Czech. This course gives basics of programming in TeX (plain TeX, ConTeXt, LaTeX, OpTeX, LuaTeX). Te second part of the	course focuses on	typographic
51 = 10 = 1	rules.		
BI-TIS.21	Information Systems	Z,ZK	5
	ourse is to familiarise students with the information systems topic and information systems implementation principles. During the cour- xisting types of systems and their usage in specific industry segments. Students are familiarised with the CRM, ERP, MRP and other		
	tal part of the course is the introduction to key ideas of an information system selection, evaluation of information system benefits, wa		·=
implementation an	d information system implementation based on the project management principles. The emphasis is on the initial customer analysis,	customer insight a	nd ability to
	s better to implement any existing information system or to develop a new one from scratch. These factors determine the information sy	•	
	of the course information systems security, operation, support, maintenance, legislation impacts, and government information system		
BI-TJV.21	Java Technology	Z,ZK	5
The goal is to provi	de knowledge and skills for developing information systems and applications through concepts used in software development and exp from Java language ecosystem. At the course end, the students are able to develop software systems in Java platform.	enence with librari	es and tools
BI-TPS.21	Computer Networks Technologies	Z,ZK	5
	uces students with basic and advanced technologies, components, and interfaces of contemporary computer networks at the physical		erlap to the
	ires provide theoretical foundations of these technologies and explain relevant physical principles. In the labs, the respective technologies	_	
with the most impo	ortant ones students will get hands-on experience. Thematically, the course covers both local and long-range optical networks, Ethern always with focus on high-speed networks.	et, modern wireles	ss networks,
BI-TS1	Theoretical Seminar I	Z	4
	THEOTERICAL SETTINAL I It is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classic		
	ually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a		
	other scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.		
BI-TS2	Theoretical Seminar II	Z	4
	ar is intended for students which want to come in deeper contact with contemporary theoretical computer science. It is mostly a classic		
are treated individu	ually and concern themselves with interesting topics from the latest research in the area. Therefore, an integral part of the course is a vother scholarly literature. The capacity is limited by the the potentials of the teachers of the seminar.	work with scientific	papers and
	outer sortotary interactive. The capacity is infinited by the title potentials of the teachiers of the setfillial.		

BI-TS3 Theoretical Seminar III Ζ 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 7 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.21 User Interface Design Z,ZK Students gain a basic overview of methods for designing and testing common user interfaces. They get 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 methods that bring users into the development process to ensure optimal interface for them. Design of Web Applications BI-TWA.21 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 React. BI-TZP.21 Technological Fundamentals of Computers Z,ZK 5 Students get acquainted with the fundamentals of digital and analog circuits, as well as basic methods of analyzing them. Students learn how computer structures look like at the lowest level. They are introduced to the function of a transistor. They will understand why processors generate heat, why cooling is necessary, and how to reduce the consumption; what the limits to the maximum operating frequency are and how to raise them; why a computer bus needs to be terminated, what happens if it is not; how a computer power supply looks like (in principle). In the labs, students model the behavior of basic electrical circuits in SW Mathematica. BI-UKB.21 Introduction to Cybersecurity The goal of the course is to provide students with the introduction of basic concepts in modern approach to cybersecurity. Students will get a basic overview of threats in cyberspace and attacker techniques, security mechanisms in networks, operating systems and applications, as well as of basic cyberspace regulations BI-ULI Introduction to Linux 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-UOS.21 Unix-like Operating Systems 5 Unix-like operating systems represent a large family mostly open-source codes that kept bringing during the history of computers efficient innovative functions of multiuser operating systems for computers and their networks and clusters. The most popular OS today, Android, has a unix kernel. Students get overview of basic properties of this OS family, such as processes and threads, access rights and user identity, filters, or handling files in a file system. They learn to use practically these systems at the level of advanced users who are not only able to utilize powerful system tools that are available to users, but are also able to automatize routine agenda using the unix scripting interface, called shell. BI-VAK.21 Selected Applications of Combinatorics The course aims to introduce students in an accessible form to various branches of theoretical computer science and combinatorics. In contrast to the basic courses, we approach the issue from applications to theory. Together, we will first refresh the basic knowledge needed to design and analyze algorithms and introduce some basic data structures. Furthermore, with the active participation of students, we will focus on solving popular and easily formulated problems from various areas of (not only theoretical) informatics. Areas from which we will select problems to be solved will include, for example, graph theory, combinatorial and algorithmic game theory, approximation algorithms, optimization and more. Students will also try to implement solutions to the studied problems with a special focus on the effective use of existing tools. BI-VDC.21 Virtualization and Data Centers The aim of the course is to familiarize students with technology basis of cloud computer systems. It shows principles and techniques used in design and implementation of data center infrastructure, such as various kinds of virtualization and high availability of servers, storages, and software layers. The course guides through data center technologies from private to public and hybrid clouds. Student learn current trends in the architecture of IT infrastructure and its configuration for classic and cloud applications. Students will understand the design, validation, and operation of complex infrastructures for modern applications with respect to scalability and protection against overloads, outages, and data losses. BI-VES.21 **Embedded Systems** 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-VHS** Virtual game worlds ZK 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-VIZ.21 Data Visualization The course offers an overview of the types and characteristics of data as well as suitable visualization methods. This will aid the students in understanding data, their content and their application in areas such as data mining and machine learning. Within the course, students will be introduced to exploratory data analysis, preprocessing, and ways of visualizing different kinds of data such as text, social networks, time series or basic image data processing. Students will get hands-on experience in applications of selected methods to real-world examples in the Python programming language. **BI-VMM** Selected Mathematical Methods The lecture begins with an introduction to the analysis of complex functions of a complex variable. Next, we present the Lebesgue integral. We then address Fourier series and their properties. Further, we introduce and study the properties of the Discrete Fourier Transform (DFT) and its fast implementation (FFT). We discuss the wavelet transform. We examine the linear programming problem in more detail and its solution using the Simplex algorithm. Each topic is demonstrated with interesting examples. BI-VPS.21 Selected Topics in Computer Networking The course builds upon the Computer Networks course (BI-PSI), obligatory for the program. Students will learn in detail principles, protocols, and technologies used in modern computer networks from local area networks up to Internet, with focus on switching, routing, security, and virtualization. The emphasis will be on gaining practical experience with real network devices in the lab and learning important methods of local area and wide area networks from the viewpoint of functionality, performance, and security. BI-VR1 Virtual reality I 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. It improves computational thinking, empathy and shared social activities. BI-VR2 ΚZ Virtual reality II 3 Continuation of the course Virtual Reality I. The new course focuses on collaborative telepresence, spatial computing and social life of avatars. The objective is to develop applications for computer science and gamification in various social metaverse and desktop engines.

BI-VWM.21	Searching the Web and Multimedia Databases	Z,ZK	5
_	ic overview about search techniques in the web environment that is interpreted as a very large distributed and heterogeneous storage information about search techniques in text and hypertext documents (the web pages themselves) and about feature extraction from v		
· · · · · · · · · · · · · · · · · · ·	arity search in multimedia databases (generally in collections of unstructured data). They also learn techniques for programming web search		
-	data types (documents).		
BI-ZIVS	Intelligent Embedded System Fundamentals	KZ	4
_	ed system fundamentals course is focused on high-level technology embedded systems integrating artificial intelligence. The aim of the robot control and development of applications in a graphical development environment. Lectures provide fundamentals of motion control		
	avigation and development tools. In labs, students program a set of basic task by using the robot simulator and real hardware to get p	-	
	technologies.		
BI-ZNF	PHP Framework Nette - basics	KZ	3
Students will gain t	he basics of PHP framework Nette. They will learn how to practically work with MVP architecture and various libraries of this Czech po knowledge should serve for the efficient creation of a web backend in PHP language.	pular framework. I	he resulting
BI-ZNS.21	Knowledge-based Systems	Z,ZK	5
	me familiar with the systems based on knowledge (knowledge-based systems), which are systems that usetechniques of artificial intel	'	roblems that
	gment, learning and reasoning from findingsand actions. The course introduces students to the philosophy and architecture of knowled	-	s to support
BI-ZPI	cision-makingand planning. The course assumes knowledge of set theory, probability theory, artificial neural networks, and evolutiona	KZ	4
	Process engineering fundamentals of process engineering in this subject. Students will get necessary foundations for understanding formal principles of p		
	used notations (UML, BPMN, BORM). The focus in this subject lies in training of practical skills of formalisation and modelling of busi	_	
CASE tools. The ro	ole of process engineering for information systems development is discussed as well as its importance in the overall context of information.	ation and business	s strategy of
BI-ZRS.21	an enterprise.	7 71/	5
_	Basics of System Control an introduction to the field of automatic control. Students will gain knowledge in this rapidly evolving field of great future. We will focus	Z,ZK s our attention par	1 -
-	ering and physical systems. We will provide basic information from the feedback control of linear dynamical SISO systems, description	-	-
=	ic systems analysis and design verification, simple PID feedback, PSD, and fuzzy controllers. Students will learn the methods of creati	-	
	linear dynamic systems analysis and design verification and simple PID feedback, PSD, and fuzzy controllers. Attention is also given es of stability in control systems, single and continuous adjustment of the controller parameters, and certain aspects of the industrial		
	and digital controllers and PLC control.		001111111111111111111111111111111111111
BI-ZS10	Bachelor internship abroad for 10 credits	Z	10
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or re-		
	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professio y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr		
	foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into	-	
	exceeds the academic year's dead-line.	_	
BI-ZS20	Bachelor internship abroad for 20 credits	Z	20
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or re an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the professio		
internship. Auxiliar	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr	respond to 4 week	s 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	o two subjects if th	ne internship
BI-ZS30	exceeds the academic year's dead-line. Bachelor internship abroad for 30 credits	Z	30
	n once within his / her bachelor's study programme have a foreign internship at a foreign university or other foreign scientific and/or re-	_	
•	an of the FIT, or the vice-dean for study affairs assesses the professional content. The student must provide evidence of the profession		
	y courses BI-ZS10, BI-ZS20, BI-ZS30 are used used for the evidence and evaluation of the internship in IS KOS. Every 10 credits corr foreign institution. The maximum number of credits a student can earn for one internship is 30 credits. This amount can be divided into	-	
employment with a	exceeds the academic year's dead-line.	o two subjects ii tii	ie internanip
BI-ZSB.21	Basics of System Security	Z,ZK	5
-	purse is to provide introduction to basic concepts in security of computer systems. Further, the course introduces the basics of forensi	-	
such as maiware	analysis or incident response. After finishing the course student will get both theoretical and practical knowledge in the area of moder as well as skills needed for independent work in the area of operating system security incident analysis.	n operating syster	ns security,
BI-ZUM.21	Artificial Intelligence Fundamentals	Z,ZK	5
	troduction to artificial intelligence with emphasis on symbolic techniques. The design of an intelligent agent and the techniques needed		
	decision-making level. The intelligent agent in the context of the course can be represented for example by a physical robot, but also be		entity, such
BI-ZWU	virtual assistant or a character in a computer game. We will not only introduce the basics, but also show the current state-of-the-art dual line of the computer of the current state of the current state.	Z,ZK	4
BI-ZWO	This course is presented in Czech.	2,210	' '
BIE-CSI	Introduction to Computer Science	Z	2
	ory class on Elementary Computer Science for broad audiences: bachelor students in computer science, students majoring in other fie		
	ool students, anybody with a background in basic math and the desire to understand the absolute basics of computer science.The go rinciples of computer science for students to understand, early on, what computer science is, why things such as high-level programr		
•	rance, and even how, on a basic yet representative and practically relevant level. After taking the class, students are able to answer no		
questions but also	questions about themselves such as which courses to take next and which books to follow up with, ideally realizing if they are interest	sted in computer so	cience more
DIE DIE	than expected, or even less than before.	7 71/	
BIE-DIF This course provide	Differential equations as a foundational overview of differential equations, starting with basic motivation and examples of ODEs and progressing to essential sc	Z,ZK olution methods like	5 e separation
· ·	theorems on existence and uniqueness establish when solutions can be guaranteed. Linear and system-based ODEs are covered wit		
	rsis, followed by examples of non-linear models such as predator-prey and epidemiological models to showcase real-world application	=	
partial differential	equations (PDEs) extends these concepts to multi-variable contexts. The course will also cover numerical methods for solving ODEs and explicit Euler methods, Runge-Kutta methods, and finite element methods for both ODEs and PDEs.	and PDES, includ	ing implicit
	2.2.2.1 2.2.2.2.3 2.2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.4 2.2.		

BIE-EEC The BIE-ECC course car	English language external certificate n be recognized for any active semester after the submission of a certificate certificate that demonstrates their proficiency in Englis the B2 level of the Common European Framework of Reference for Languages.	Z sh comparable to o	4 r exceeding
BIE-IMA2 Students refresh and ext	Introduction to Mathematics 2 tend knowledge of elementary functions and their properties. Students understand basic mathematical principles and they are a examples.	Z ble to apply them i	2 n particular
BIE-SEG	Systems Engineering	Z	0
This is an introductory cl to understand processor	lass on systems engineering for bachelor students in computer science. The goal of the class is to introduce basic principles of c r and memory virtualization. Seeing and actually understanding virtualization is the overarching theme of the class. After taking t ence between processes and threads as well as emulation and virtualization, what virtual memory is and how it works, what con	perating systems he class, students	for students are able to
	parallelism, and how processes and threads synchronize efficiently to overcome concurrency for communication.		
BIE-ZUM Students are introduced	Artificial Intelligence Fundamentals to the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical contents are the fundamental problems in the Artificial Intelligence, and the basic methods for their solving. It focuses mainly on the classical contents are the fundamental problems in the Artificial Intelligence fundamentals.	Z,ZK al tasks from the ar	4 eas of state
space search, multi-ager	nt systems, game theory, planning, and machine learning. Modern soft-computing methods, including the evolutionary algorithms be presented as well.	s and the neural ne	etworks, will
FI-TOP	Academic writing	Z	2
publications can be used write a scientific article, v else's article. The cours	nt and required part of research activity. It is not only about obtaining research results but also about applying them in the form of ful for students not only in their own publishing activities but also in the preparation of a bachelor's or master's thesis. In the court what parts such an article should have, and how the peer review process works. Students will also try their hand at presenting an are will be taught in blocks, with one lecture at the beginning of the semester and one practicum in the middle of the semester. Date on the availability of enrolled students.	rse, students will le article and reviewir tes will be determi	earn how to
FIT-SEP	World Economy and Business	Z,ZK	4
and key regions of world	ed in Czech. The course introduces students of technical university to the international business. It does that predominantly by concerning to the conomy. Students get to know about different religions and cultures, necessary for doing business in diverse societies as well as development, which are needed for the right investment decision. Seminars help to improve on the knowledge in the form of discreasings. It is advised to take bachelor level of this course BIE-SEP as a prerequisite.	indexes of econom	nic freedom,
FITE-EHD	Introduction to European Economic History	Z,ZK	3
The course introduces a	a selection of themes from the European economic history. It gives the student basic knowledge about forming of the global ecol	nomy through the	description
of the key periods in his	story. As European countries have been dominant actors in this process it focuses predominantly on their roles in the economic	history. From large	economic
•	o fragmentation of the Middle Ages, from destruction of WWII to the current affairs, the development of modern financial institution	=	
does not cover detailed	l economic history of particular European countries but rather the impact of trade and role of particular events, institutions and o	rganizations in his	tory. Class
NII 455	meetings will consist of a mixture of lecture and discussion.	147	
NI-AFP	Applied Functional Programming	KZ	5
•	I in Czech. Functional programming represents one of the traditional programming paradigms. Traditional and novel functional programming paradigms. Traditional and novel functional programming paradigms.		- 1
the fise howadays and	the functional paradigm becomes an important construct of traditionally imperative languages (C++, C#, Java). As such, masteri necessary competence of a software engineer: the theory and especially the practice.	ing this paradigm t	Decomes a
NI-DDM	Distributed Data Mining	KZ	4
= =	ے e-of-the-art approaches for distributed data mining and parallelization of machine learning algorithms. Students will gain hands o		- 1
	ork Apache Spark and with existing distributed DM / ML algorithms. They will learn principles of their parallel implementations a approaches to parallelize other algorithms. The course is prezented in czech language.		- 1
NI-DSP	Database Systems in Practes This course is presented in Czech.	Z,ZK	4
NI-DZO	Digital Image Processing	Z,ZK	. 4
implement and have an in of digital image proces frequency domain, abstr	comprehensive overview of modern methods for interactive editing of digital images and video. It mainly deals with practical algoriteresting theoretical basis. Visually attractive applications provide better understanding of basic theoretical background that is also ssing. This course will introduce algorithms solving the following practical applications: edge-aware editing, tone mapping, HDR raction, hybrid images, gradient domain editing, seamless image stitching and cloning, digital photo-montage, color-to-gray conversations and the second state of the following practical applications:	o valuable outside compression, de-b ersion, context enl	the domain durring in nancement,
	s-possible image deformation, free-form image registration, texture synthesis, interactive segmentation, colorization, painting, ac		
NI-IAM	Internet and Multimedia	Z,ZK	4
	ocused on principles and modern technologies for network transmissions of audiovisual (AV) signals. The syllabus includes acqu Is (output), network communication protocols, device interfaces, codecs, data formats and stereoscopy. We will look at practical u	_	
	ns. Within the labs, students will practically assemble AV transmission chains using HW and SW technologies and verify the effe		II.
	f AV transmissions. Students will learn how to build Internet infrastructure for end-to-end AV transmissions from the recording the for audience.		
NI-LSM	Statistical Modelling Lab	KZ	5
- 1	on a single and multi-target tracking. The student both learns the existing methods and tries to implement them. The stress is p	l l	
available information and	d its modeling using numpy and scipy. The second half of the semester is focused on the design of methods and algorithms, and 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		properties.
NI-MOP	Modern Object-Oriented Programming in Pharo	KZ	4
Object-oriented program	ming is currently one of the most widespread paradigms of software creation, especially enterprise information systems, where i	ts ability to natural	
•	modern applications. In this course, we build on the knowledge acquired in the course BI-OOP and aim to further deepen the skills odern pure object system Pharo (https://pharo.org). The course focuses on individual approach to students, their development no		II.
	pject programming skills, which are generally applicable in other OO languages, students will also gain the opportunity to work o		
• •	f semestral work with the possibility of cooperation with practice and related bachelor, diploma, postgraduate our direct involvem		
NI-MPL	Managerial Psychology	ZK	2
NI-MSI	Mathematical Structures in Computer Science	Z,ZK	4
l l	tics of programming languages. Data types as continous lattices, Scott topology. Procedures as continuous mappings. The Scott	· .	
	Introduction to category theory.		
NI-OLI	Linux Drivers	Z,ZK	4
· ·	tem is an important operating system for personal computer and also for embedded systems. Systems on chip and combining po		
increase the variability	of peripheral subsystems requiring specific software drivers. This course is an advanced course in the Linux driver development or ovides knowledge of Linux operating system architecture, principles of development of various types drivers, including practical	nt for master's stud	

NI-PDD	Data Preprocessing	Z,ZK	5
	pata Treprocessing orepare raw data for further processing and analysis. They learn what algorithms can be used to extract information from various data s	'	1
	and learn the skills to apply these theoretical concepts to solve specific problems in individual projects - e.g., extraction of characteris		•
time series, etc., a	pages.	dos nom images c	n nom web
NI-PSD		KZ	4
	Public Services Design		1 -
	roduce students to specifics of UX, Service design and development for public sector. We will look into the design and development p	•	•
suppliers (devs a	and designesr) as well as clients. In small teams students will work on projects from partner organizations and will try out collaboration	n with client repres	sentatives.
NII DOI	Course is aimed at students-designers as well as clients.	7.71/	
NI-PSL	Programming in Scala	Z,ZK	4
	uces the modern programming language Scala which exploits object-functional paradigm. Scala comprises advance language featur	٠.	•
advance standard i	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.		
NI-REV	Reverse Engineering	Z,ZK	5
	cquainted with the essentials of reverse engineering of computer software. They will learn how processes start and what happens before		
	s will understand how executable files are organized and how they interact with 3rd party libraries. Another part of the course is dedicated as a second of the course is dedi		
* *	tten in C++. Students will also understand principles of disassemblers and obfuscation techniques. A part of the course will also be di	•	•
debuggers and de	ebugging 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. T	he focus of
	the course is on the seminars, where students will solve practically oriented tasks from the real world.	ı	
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 va	arious 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 will gain	knowledge about circuit testing and about methods for increasing reliability and security. They will get practical skills to be able to pre	pare a test set witl	n the help of
the intuitive path se	ensitization and to use an ATPG for automatic test generation. They will be able to design easily testable circuits and systems with bu	ilt-in-self-test equi	pment. They
	will be able to compute, analyze, and control the reliability and availability of the designed circuits.		
NI-VCC	Virtualization and Cloud Computing	Z,ZK	5
Students will gai	in knowledge of architectures of large computer systems that are used in data centers and computer infrastructure of companies and	organizations. Th	ey will get
acquainted with vi	irtualization principles, tools and technologies that serve to facilitate and automate configuration, testing and monitoring, and to efficie	ently operate and o	optimize the
performance pa	trameters of modern computer systems. Theoretically and practically, they will get acquainted with containerization as the most effect	ive technology tod	ay for the
management of co	mplex computer systems and with specific technologies of cloud systems. Finally, they will learn the principles and gain practical skills in	n the use of moder	n integration
	and development tools (Continuous integration and development).		
NI-VYC	Computability	Z,ZK	4
	Classical theory of recursive functions and effective computability.	,	1
TV1	Physical Education	Z	0
TV2	Physical Education	Z	0
TV2K1	Physical Education 2	Z	1
TVK1	Physical Education	Z	1
TVKLV	Physical Education Course	Z	0
TVKZV	Physical Education Course	Z	0
TVV	Physical education	Z	0
TVV0	Physical education	Z	0
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For updated information see http://bilakniha.cvut.cz/en/FF.html Generated: day 2025-07-05, time 04:07.